Orbit

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Journal of the Radio Amateur Space Program

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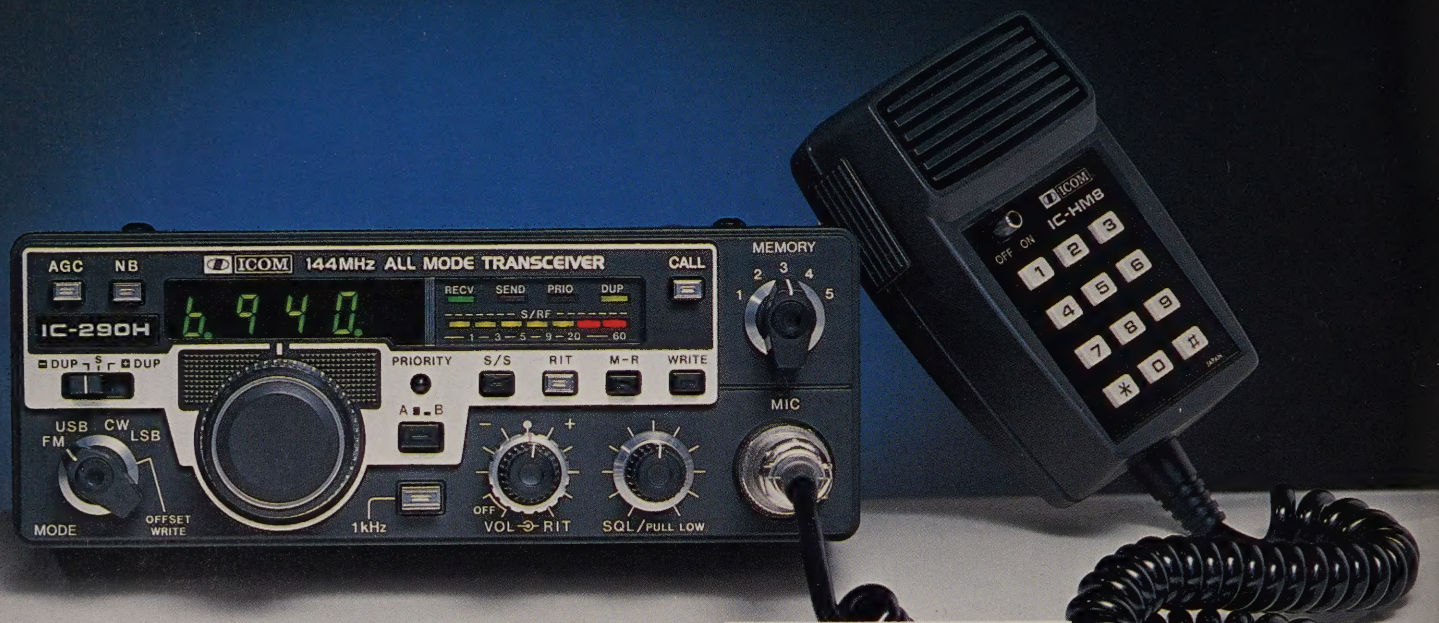

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1MHz Up Button		Not Req'd	Yes
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	FM2	Not used	25
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March/April 1983
Volume 4 Number 2

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Our Cover: Konrad Mueller of AMSAT-DL prepares to mate Phase IIIB and attach fitting to shake table test facility in West Germany, October, 1982. The solar panels have protective covers in place.

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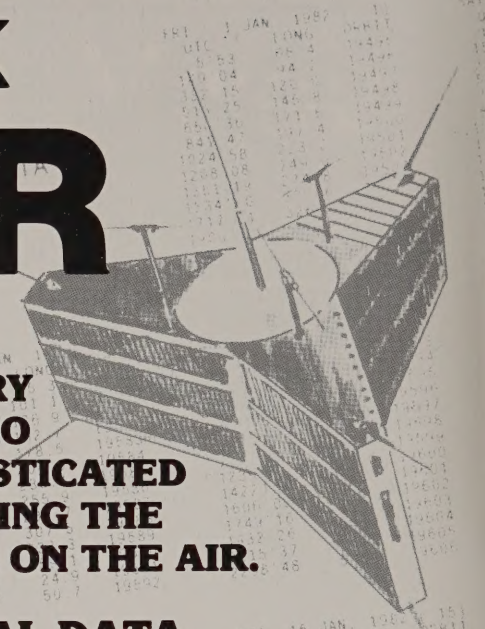

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Ellipsis...

An Editorial By Vern Riportella, WA2LQQ*

North American amateurs recently witnessed a milestone in amateur radio communications. On the evening of March 3, ARRL President Victor C. Clark, W4KFC, sat in his modest home in rural Clifton, Virginia. But the rural setting would only bely the fact that at that moment Vic sat at the nucleus of an unprecedented amateur radio communications network.

Amateurs had established around Vic a network of terrestrial repeaters and hf links that would bring W4KFC into contact with tens of thousands of amateurs across 39 states and the Province of Ontario. The scope of this undertaking was breathtaking and its implementation by W0TN and his colleagues at the Honeywell Amateur Radio Club in Minneapolis was satisfying.

''Why,'' you might well ask, ''is *Orbit* and AMSAT interested in the goings-on on those 'pedestrian' repeaters?''

Besides the fact that ARRL's Mr. Clark is an articulate individual with both mission AND message, *Orbit* believes there are other aspects that should not be overlooked. We are especially stimulated to look beyond the bedazzling technology and the polish of W4KFC's presentation to find a rich symbolism and the spectre of enormously powerful forces lurking.

It should seem apparent to those who've followed the evolution of amateur satellites that the day would come when OSCAR would cross the threshold to maturity. After an extended adolescence OSCAR appears ready for the rites of Spring to be played out in the jungles of French Guiana this June. The mature bird will offer the amateur world a communications tool unprecedented in history. In fact, there exists today no parallel nor does the commercial segment even offer the prospect of a communications tool so powerful as will be OSCAR 10. It is in the realm of communications power that we see parallels between W4KFC's presentation and the new OSCAR.

While with considerable skill and preparation W0TN and crew contrived the network which reached out to tens of thousands, it took coordination, consultation and consternation to pull it together. With Phase IIIB, within a few months of the time you are reading this, a network of thousands could be pulled together very quickly indeed! The new OSCAR will view more than half the world's amateur population much of the time and up to 80% on occasion. The potential for great good is enormous. Unfortunately the potential for disruption also exists.

Every day that the new OSCAR orbits the earth will open new opportunities for amateurs to pull together to overcome the inherent problems that absence of reliable communications inevitably promote. Every day can mean an upgrade in the speed and accuracy with which important issues can be brought before the entire amateur radio community. Every hour can mean new inroads to easing the logjams of communications present in today's crowded hf bands.

How will amateurs respond to the challenge and potential of this new, powerful resource—this magnificent new communications tool? We are very optimistic about it. If we weren't we would have rolled belly-up when Phase IIIA took a bath. Surely there will be new problems to counter. Language problems and claims of ''eminent domain'' may arise. But given a spirit of cooperation by all combined with a healthy respect for the medium itself, we believe startup problems can be minimized. All it takes is a willingness to listen and cooperate in this new adventure we enter together.

The symbolism we saw in W4KFC's presentation was that of bringing technology to bear on a specific problem: getting across the ARRL message to amateurs. The result was certainly the high water mark for amateur radio communications power. But power comes in many ''flavors''. It is constituted of various forces. Throughout history the ability to inspire has universally led to power. The new OSCAR has built into it the potential for great power for good. With the inspiration of the greatest communication tool ever fielded by amateurs filling our sails, let us ply the ether for great good in what will always be recalled as the dawning of amateur radio's greatest age.

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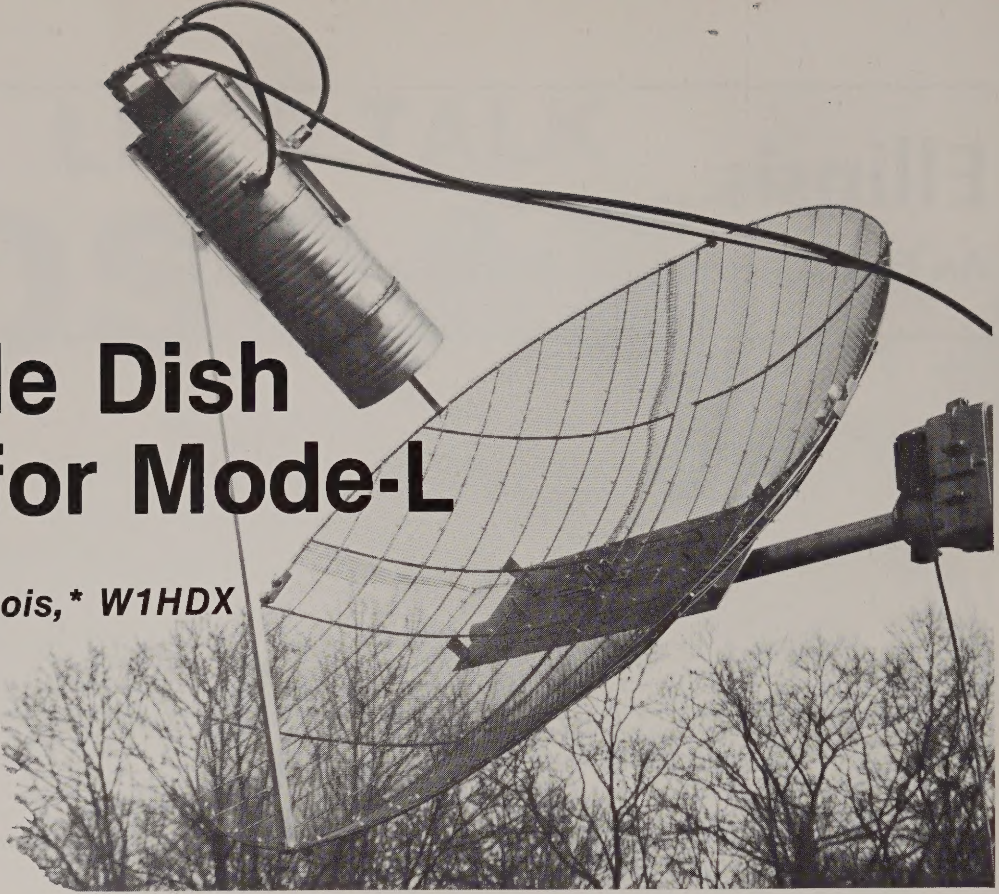
*Editor-In-Chief

A Simple Dish for Mode-L



By Dr. John L. DuBois,* W1HDX

Antenna requirements for communication through the Mode L transponder of the Phase IIIB satellite are not easy to satisfy with off-the-shelf components. Required minimum gain ranges from 12 dBi for 50 watts of transmitter output to 24 dBi for a 3 watt output at 1270 MHz. These values span the range from a simple yagi to an efficient dish antenna. Linear element and loop element yagis for 1296 MHz are available but have insufficient bandwidth to work well in the 1269.15 to 1269.95 passband of the Mode L transponder.

If this isn't a sufficient impediment, then the polarization problems may discourage many potential users. To avoid severe fading from satellite spin and to match the spacecraft antenna polarization, it will be necessary to use right hand circular polarization in transmitting and receiving antennas. It is difficult to obtain circular polarization from currently available 1296 MHz Yagis. These are not built as two independent, interleaved antennas at right angles although this is common practice at 70 cm. Loop yagis are even harder to use for circular polarization since this would require two balanced and phased feeds to the loop radiator.

Consequently I felt a small dish would represent the easiest type of antenna to construct for the Phase IIIB Mode L uplink as long as a suitable feed could be designed for circular polarization. For several years weather satellite hobbyists who have built stations to receive the GOES series of geostationary satellites broadcasting on 1691 MHz have used four foot diameter dish antennas sold by Montgomery Ward for UHF television. This antenna is built from 3/16 inch steel wire welded into the shape of a parabolic dish. It comes knocked down in two halves with a separate dipole and reflector feed. It is designed to be assembled with the support mast across the front of the dish tied to the post holding the feed dipole. There have been many adaptations of this assembly for GOES use at 1691 MHz, and the basic parts lend themselves to mounting in a variety of ways.

The dish is sold by Montgomery Ward as catalog #63A19293R and was priced at $39.95 in the 1982 catalog. It is 48 inches in diameter with a focal length of 18 inches giving an f/d of .375. If illuminated with 50% efficiency this would yield a gain of 21 dB at 1270 MHz with a −3 dB beamwidth of approximately 16 degrees. This kind of performance would match nicely to a 10 watt output transmitter at 1270 MHz; a power level which will soon be available from several sources in solid state.

Having decided on the basic reflector, it was necessary to choose a suitable feed system which could produce circular polarization. Here the experience of the EME community was helpful. Many EME stations use circular polarization at 70 cm and shorter to combat the effects of Faraday rotation on their signals. A popular feed in EME use at 1296 MHz is a circular horn with two quarter wave stub radiators inside set at right angles and fed 90 degrees out of phase. This produces the required circular polarization and is inherently unbalanced for simple coax feed.

For Mode L use, all that was necessary was to redesign the feed for 1270 MHz and devise a suitable scheme to feed the two radiator stubs 90 degrees out of phase. In addition, it seemed desirable to build a mounting bracket which would not require the support boom to pass in front of the dish as in the original design. The last task proved easy, but the feed horn design turned out to require far more empirical adjustment than expected.

---

*Chief, Phase IIIB Ground Command Network

The dish surface is covered with ¼ inch mesh galvanized hardware cloth. This is available at many hardware stores in different widths. A 6 ft. by 4 ft. piece will be plenty. Because of the parabolic shape of the reflector, it cannot be covered in one piece. Four pieces of the cloth are suitable if applied with about two inches of overlap to the four quadrants of the dish. The means for mounting the dish to the boom is shown in Figure 1. A flat aluminum plate is made from 1/8 inch stock and fastened to the wire frame of the dish by standoff-clamps at four corners of the plate. At the center, two spacer blocks clamp between the dish and mounting plate. The standoff clamps can be bent from 1/16 inch aluminum or 1/32 inch steel strap. They are clamped around the wires of the dish and fastened to the boom plate with 6-32 hardware. The two halves of the dish should first be bolted together at the edges using the original loops in the dish wire for this purpose. Then the boom plate is fastened to the back of the dish using the clamps. Be careful that the clamps do not pull the dish out of its natural shape; bend new ones if this appears to be happening. Then start applying the hardware cloth to the dish surface. Put it on one quadrant at a time and fasten to the dish wires with plastic ty-wraps. (Wire twists can be used too, but they are more time consuming.) Try to get a fastener every three inches or so along the dish wires. Overlap several inches when applying wire to the other quadrants. When finished with each quadrant, cut off the hardware cloth flush with the edge of the dish and carefully dress the wire ends down smooth. These ends can cut you severely if you are careless!! The completed dish will be quite rigid.

The feed horn proved to be the most difficult part of the project to design. It is basically a piece of circular waveguide operated above the TE11 mode cutoff and below the TM01 mode cutoff. It is excited by stub radiators approximately ¼ wave long and ½ wave from the closed end of the guide. This description provides enough guidance to choose the horn diameter. A #10 food can of the sort that institutional quantities of fruits or vegetables come in is 6.1 inches in diameter and 6.85 inches long. This diameter gives a TE11 cutoff of 1135 MHz and TM01 cutoff of 1484 MHz, neatly positioning 1270 MHz in between. The length should be approximately one wavelength long. This length turned out to be extremely important in tuning the feed for 1270 MHz and determining bandwidth. The diameter and length of the feed stubs are also important tuning factors determining primarily the input impedance. Much time was spent optimizing these dimensions with an HP swept return-loss measurement system. The result for a single feed stub (linear polarization) is 20 dB return loss at 1270 MHz over a 20 MHz bandwidth in a 50 ohm

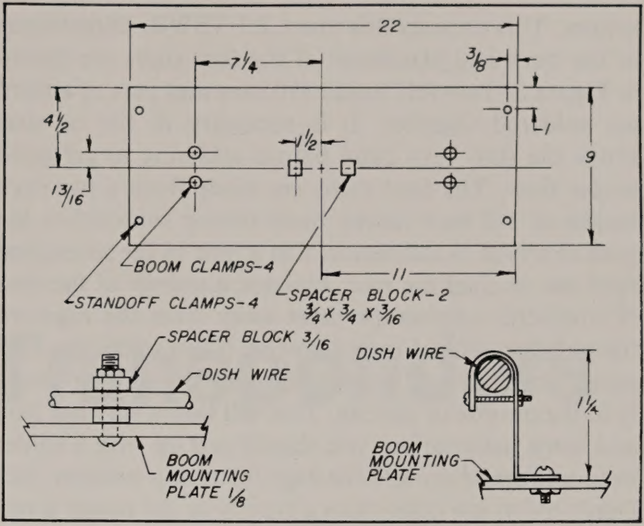


Fig. 1 — Dish mounting plate clamps and spacers. Dimensions are given in inches.

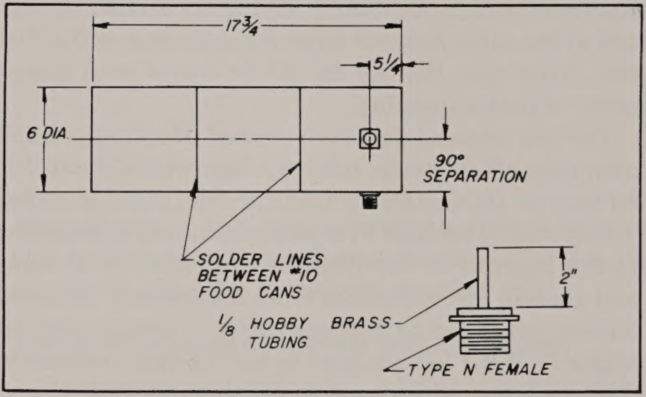


Fig. 2 — Feed horn and radiator probes. Dimensions in inches.

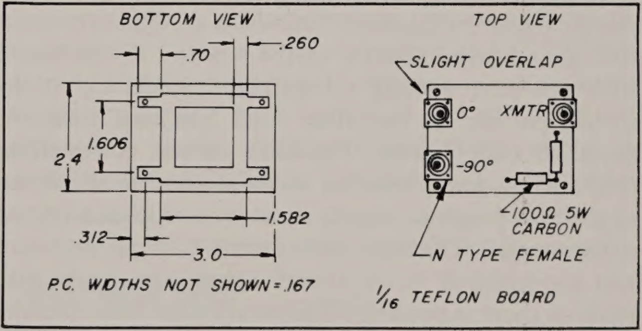


Fig. 3 — 1270 MHz quad hybrid. Dimensions are in inches.

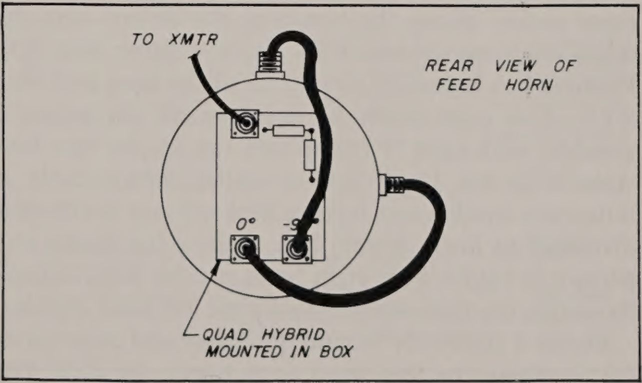


Fig. 4 — Wiring for right-hand circular polarization.

system. This corresponds to a 1.2:1 VSWR. Dimensions of the horn and placement of the feed stubs are shown in Figure 2. Two full length #10 cans and part of a third are soldered together. It is necessary to file or steel brush the rims very clean before soldering to get good solder flow. The feed stubs are made from a two inch length of 1/8 inch hobby brass tubing soldered to the post of a type N connector. Cut a hole in the assembled feed can to clear the rear insulator diameter of the type N connector and scrape paint away from the edges of the hole for about 1 inch diameter. Then solder the connector shell (already assembled to the brass stub) directly to the outside of the can. This will take a very hot iron and some patience but you should end up with a solder bead uniformly around the edge forming a weather seal. Don't try to use other than a type N as the power levels to be used require a low loss, accurate 50 ohm connector. Be sure to measure carefully to place the second connector and probe exactly 90 degrees around the can and at the same distance from the open end as the first one. After this, the can should be coated with plastic spray to prevent rusting.

The last required detail is a method of splitting the 50 ohm transmitter power into two lines with a phase difference of 90 degrees to feed the two radiator stubs. This is ideally handled by a 3 dB quadrature hybrid. The fourth terminal of the hybrid is terminated in 50 ohms and absorbs any reflections from the antenns. (It could alternately be fed to a power meter to continously indicate VSWR.) In this case the hybrid and termination were designed to handle up to 100 watts forward power. To handle this power level the hybrid was designed on 1/16 inch teflon double sided board. It is a single square design shown in Figure 3. The shells of type N connectors are soldered directly to the top foil of the board with the post coming through and soldering to the hybrid pattern on the other side. The termination is made of two, 5 watt, 100 ohm carbon composition (NOT wirewound) resistors wired in parallel on the top of the board with extremely short ground leads soldered to the top foil. The other leads extend through the board and are soldered to the fourth hybrid arm again with leads as short as possible. The resistors are then liberally covered with RTV sealant and the board mounted as the cover of a 2½ inch by 3 inch by 1¾ inch Pomona box. Four screws secure the board at the corners and the edges are covered with RTV for a weather seal. The Pomona box is secured to the rear of the horn feed with RTV. Two coax cables of equal length (16 inches is suitable) with type N connectors run to the two feed stubs in the can. Use RG213 or similar low loss cable. A little extra trouble and expense here will pay worthwhile dividends in lower system loss. Follow the connection pattern in Figure 4 for right hand circular polarization. Reversing the feed cables would yield left hand circular.

Figure 5 shows the mounting scheme and dimensions for attaching the feed horn assembly to the dish. The tripod legs are aluminum angle stock ½ by ½ inch. They are attached to the dish by U-clamps similar to those used on the boom mounting plate and secured by 4-40 hardware. At the horn, 10 inch pieces of the angle stock are fastened at equal 120 degree spacing around the diameter and the tripod legs fastened to them. The strips don't have to be 10 inches long but if you want a fine adjustment for focus you can mill a slot along these strips to receive the screw from the leg and move the feed horn easily in and out. The weight of the assembly is approximately 20 pounds. A counterweight on the mounting boom will be essential.

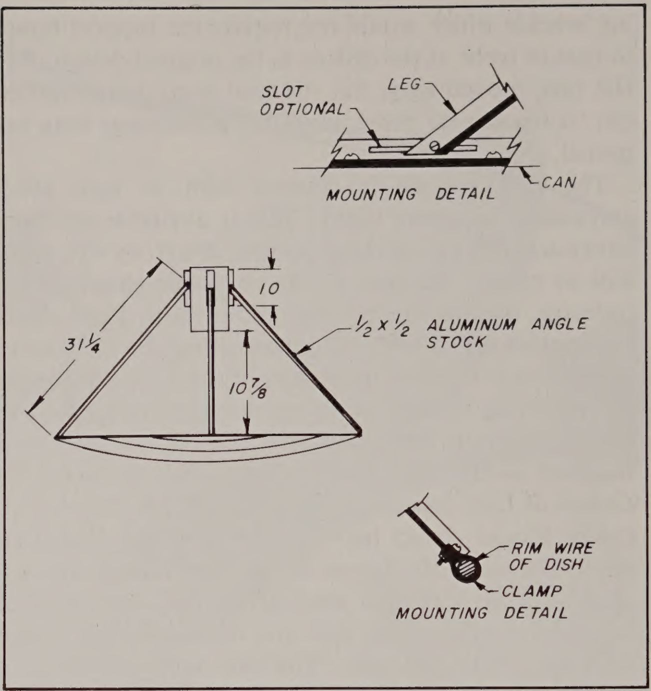


Fig. 5 — Tripod mounting leg dimensions. Dimensions are given in inches.

The end result is shown in Figure 6 as mounted on a cross boom at the opposite end from a 70 cm crossed yagi downlink antenna. The complete antenna measured through the hybrid shows a return loss of about 15 dB over a 50 MHz bandwidth. This is equivalent to a VSWR of 1.4:1 or a reflected power of about 6%. When fed with 100 watts forward power the reflected 6 watts results in noticable heating of the 100 ohm resistors on the hybrid. In early tests some RG58 cable and BNC connectors were used. This caused very hot cable at 100 watts forward power and even at the 10 watt level should be avoided because these losses are so easily reduced by using the larger cable and connectors.

This antenna system fulfills all of the requirements for Mode L uplink use at high or low power levels. At a lower level of 10 watts input, the resulting EIRP of approximately 1 kW should be adequate for transponder communication and offers the advantage of a greatly simplified transmitter final output stage within reach of solid state devices.

The Phase IIIB Transponders

By Werner Haas, DJ5KQ

Seven days after launch, both transponders on the Phase IIIB satellite will start routine operation, signalling a new era in Amateur Radio communications. After a decade of development and improvement, the world's most advanced amateur communications satellite will undertake its most important mission: unifying the world's hams through the medium of radio in the spirit of world-wide hams cooperation that created the spacecraft (s/c) itself.

The new and exciting chapter in ham radio's history will begin just five days after an apogee kick motor hurls the s/c into a highly elliptical orbit, making the two on-board transponders accessible for up to 15 hours a day.

The launch failure of the Ariane 2 booster on May 23, 1980 and the resultant loss of the Phase IIIA satellite gave designers a chance to reconsider the configuration of the planned Phase IIIB unit. Two major changes resulted: a second transponder was added to allow operation in the L band (24-cm uplink/70-cm downlink)[1] as well as U band (70-cm uplink/2-m downlink)[2] and the solid-propellant kick motor was replaced by a liquid-propellant unit from the West German manufacturer Messerschmitt-Boelkow-Blohm (MBB). Changes have also been made to the two transponders to keep them current with the state of the art. Both units are now built on printed circuit boards. This facilitated construction of spare modules for the current s/c as well as boards for upcoming Phase III missions.

The functional block diagram (Fig. 1) shows both transponders, along with the control, switching, and on-board computer systems. The right-hand side of the diagram shows the communications system with its high-gain and omnidirectional antennas, as well as the associated computer-controlled switching unit.

The U-transponder: UHF up and VHF down

The U transponder (Fig. 2) is a linear converter with a 150-kHz bandwidth extending from 435.025 to 435.175 MHz on the uplink side and 145.825 to 145.975 MHz on the downlink. Also, two beacons operate through this transponder: a general or G-beacon at 145.810 MHz with information of general interest to s/c users as well as an engineering or E-beacon at 145.987 MHz with phase-shift keyed (PSK) 400-bit/s data about the satellite's internal systems. The maximum power output

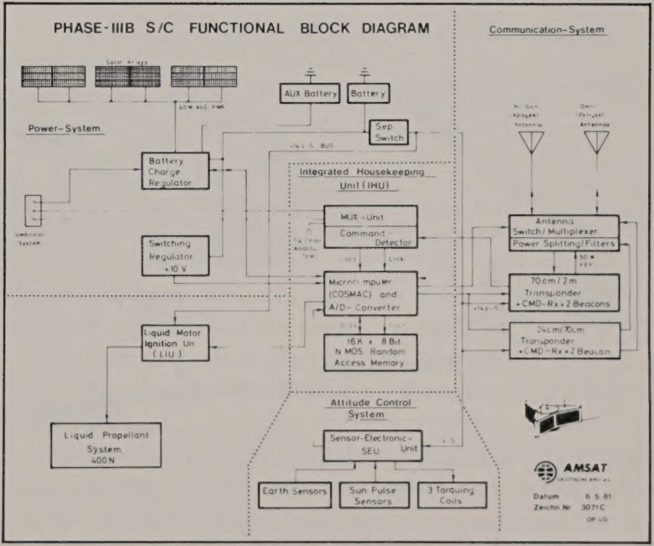

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Fig. 1 — Phase IIIB functional block diagram.

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[1] Called Mode L

[2] Called Mode B

of the two-meter downlink is 50-watts PEP, or an average of 10 to 12 watts.

For a 20 dB s/n ratio on the two-meter downlink, the satellite user must generate 21.5 dBW efffective isotropic radiated power (EIRP) for the uhf uplink. This corresponds to a transmitter power of 10 watts into a 12-dBi antenna. For reception, an antenna with an excess of 10-dBi gain is recommended. This assumes a receiver noise figure of 5 dB and a bandwidth of 2.4 kHz. With an adequate receiver, the engineering beacon on two meters will be heard with a s/n ratio of at least 17 dB.

The input section of the U transponder (Fig. 3) consists of a 4-pole filter that offers more than 60-dB attenuation of the harmonically related two-meter downlink transmitter. Attenuation at 436 MHz is a modest 0.9 dB over a 50-MHz bandwidth.

Careful selection of the bipolar input transistor, a BFR 91A, has kept the converter's noise figure to 2.6 dB. Although a better figure could have been obtained with a metal-oxide semiconductor (MOS) transistor, those devices would be damaged by the intense radiation in the Phase IIIB orbit.

A two-stage converter mixes the 435-MHz input signal to 53 MHz and then to 10.7 MHz. At the latter intermediate frequency, the signal is passed through a radar-blanker that limits all pulses that exceed the peak level of the passband by 6 dB. A 10.7-MHz crystal filter, with a 150-kHz bandwidth, allows up to 50 simultaneous conversations (QSOs), assuming 3 kHz per station. However, due to the narrowband nature of many amateur transmissions, including cw and radio teletypewriter (RTTY), many more QSOs can be accommodated within the 150-kHz passband.

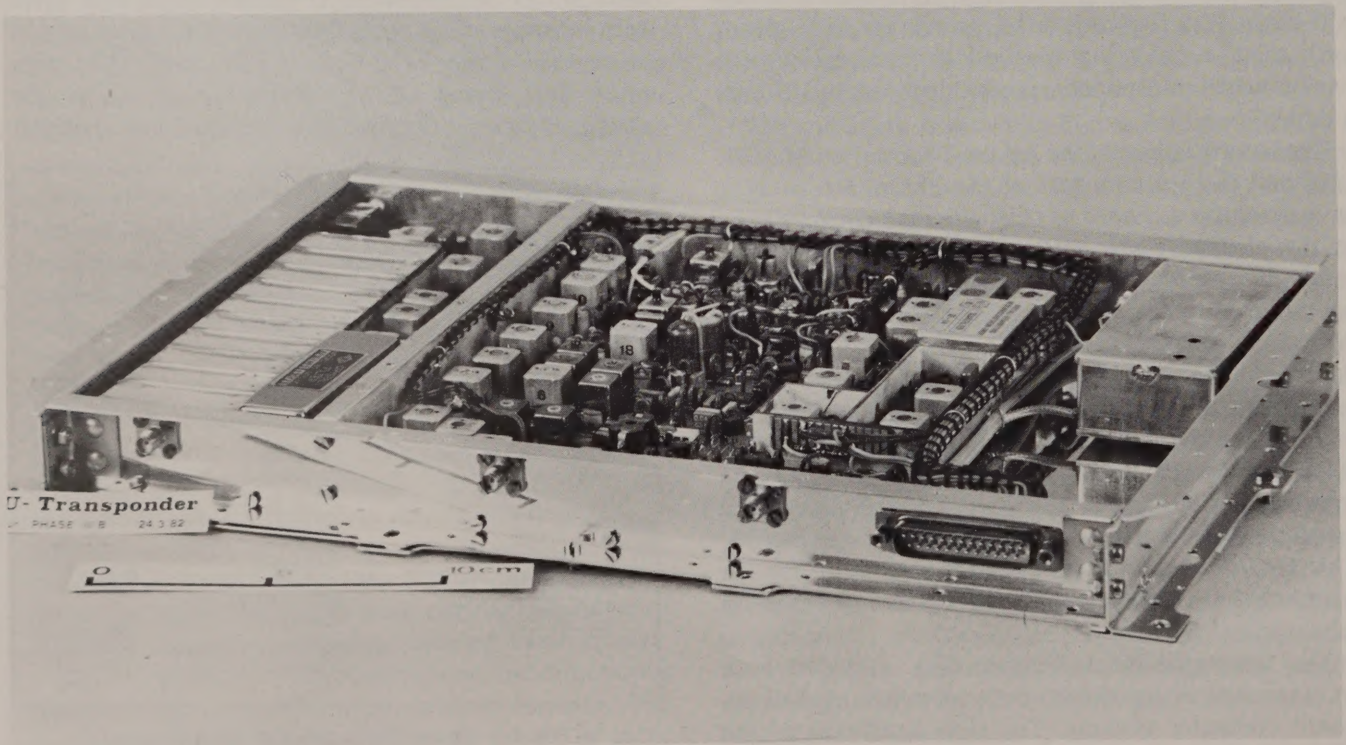
For image-frequency suppression, the signal is mixed to 28 MHz. At this frequency, the two beacon signals are introduced into the signal chain. The G-beacon transmits cw, RTTY with a 170-Hz shift, or PSK data at 400 bits/s. While transmissions from the G-beacon will be of considerable interest to the general amateur community, the E-beacon's PSK data will be of principal interest to command stations. Demodulation and display of E-beacon data on a video monitor is described by Dr. Karl Meinzer, DJ4ZC, in the West German publication *cq-DL*.

After linear amplification, the 28-MHz signal is supplied to an envelope demodulator. The amplitude component of the signal is sent to the HELAPS (High-Efficiency Linear Amplification by Parametric Synthesis) modulator while the phase component arrives at a push-pull transmitter mixer through a multistage limiter.

When mixed with the output of a 117-MHz oscillator, the 28.5 MHz passband signal is converted to a 1-mW signal at 145 MHz. Not yet potent enough for transmission, the signal is boosted, by a two-stage amplifier, to 500 mW, the power level needed to drive the final amplifier. The amplitude signal and the phase component are combined, within the final amplifier, into a linear signal output (Fig. 4).

The final-amplifier module (Fig. 5) includes a number of sub-assemblies for use by both the U and L transponders. The power amplifier for the U transponder uses two parallelled 25-watt PEP tran-

Fig. 2 — The U-transponder 435/145.9 MHz built by Werner Haas, DJ5KQ.



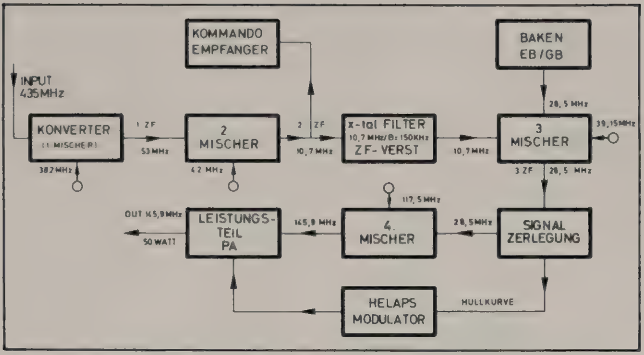


Fig. 3 — Simplified block diagram of the U-transponder.

sistors. Amplifier efficiency, at 40 percent, is some three times better than could be expected from a common linear amplifier. Parametric synthesis, the job of the HELAPS modulator, accounts for this significantly greater power output.

Crowded into the amplifier module, in addition to the two sets of solid-state finals, are the phasing lines (used to match those transistors), harmonic filters, and dc-to-dc converters. The receiver's automatic gain control (agc) circuit, also nestled into the module, provides a 30-dB control range per transponder.

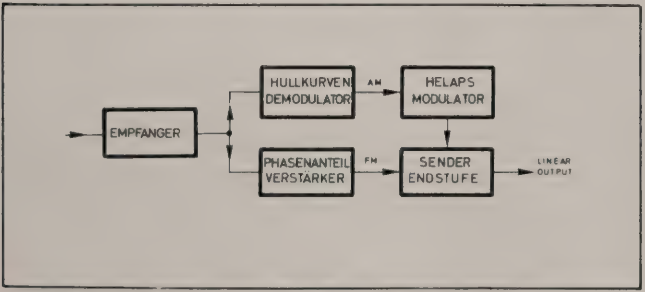
Completing the U-transponder package are right-hand circularly polarized antennas. Each has 8 dB of gain.

The communications system includes a separate command receiver (CMD) for the on-board computer. A portion of the 10.7-MHz signal is tapped from the U transponder ahead of its crystal filter. This signal is mixed to 9 MHz and is demodulated by a 3-kHz bandwidth ssb receiver. After some processing, the CMD signal is passed to the on-board computer. Search logic (afc) facilitates contact with the s/c by ground-based command stations.

The L Transponder: Ushering in OSCAR microwaves

The 800-kHz bandwidth of the L transponder, from 1269.05 to 1269.85 MHz offers the satellite enthusiast as much operating space as the 15- and 20-meter hf bands combined. Downlink reception extends from 436.15 to 436.95 MHz in a band shared with a G-beacon at 436.05 MHz and an E-beacon at 436.02 MHz. Although the transponder's maximum power output is 50 watts PEP, the average is approximately 10 to 12 watts.

Fig. 4 — Envelope elimination and restoration (EER) diagram.



Despite the distances that will often separate the ground-based station and the satellite, uplink power requirements are relatively modest. At 24 cm, the user's station should be capable of generating an EIRP of 28.8 dBW. This corresponds to 3 watts from the transmitter into a 24-dBi antenna. Alternatively, 50 watts delivered to a 12-dBi antenna will produce the same results.

For reception of the uhf downlink, an antenna with greater than 13.5-dBi gain must be used. This assumes a receiver noise figure of 3 dB and a 2.4-kHz bandwidth. With such a receiver, a monitoring station will enjoy a 17-dB signal from the engineering beacon.

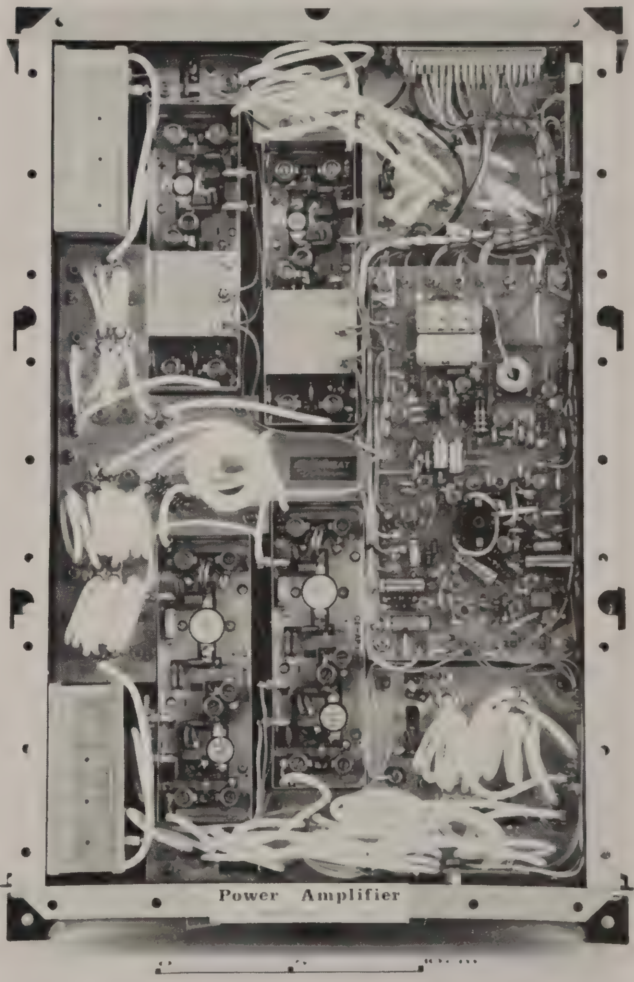


Fig. 5 — HELAPS Power Amplifier for U and L transponders built by DK4VW. Includes four transmitter power amplifiers by DL4FA.

The input to the L transponder consists of a double-conversion strip-line circuit with a GaAs FET, the MGF 1402, used as the first rf amplifier. Despite the four-pole input filter used at the front-end, the noise figure here is just 3 dB.

Because industry was not able to supply a crystal filter with the required 800-kHz bandwidth and proper shape factor, a special 9-pole coil filter was developed for the 10.7 MHz i-f stage. Design considerations demanded that the ripple from this filter be small in order to

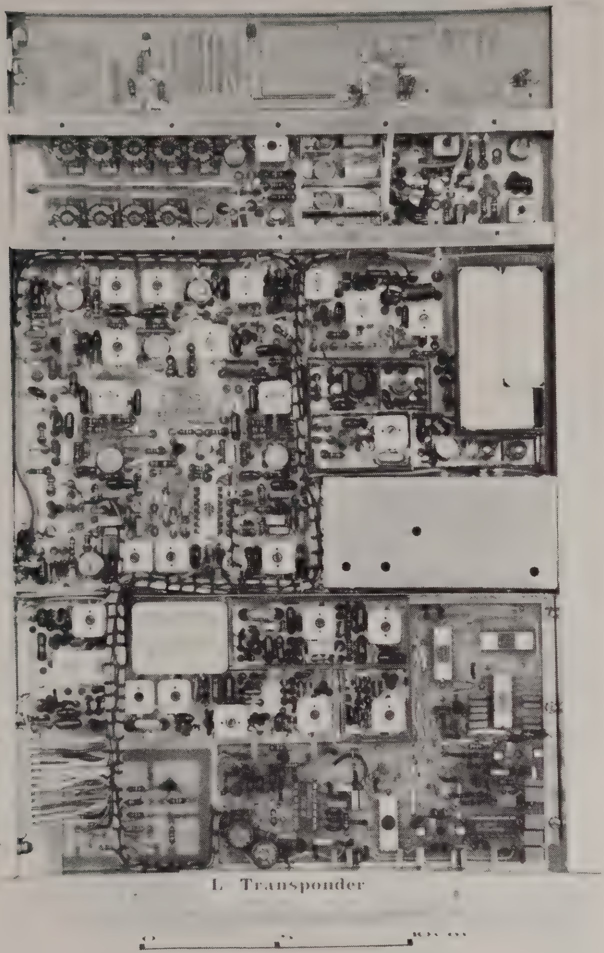


Fig. 6 — L-transponder 1296/435 MHz built by DJ5KQ. Includes the front end with 800 kHz filter by DK5GB.

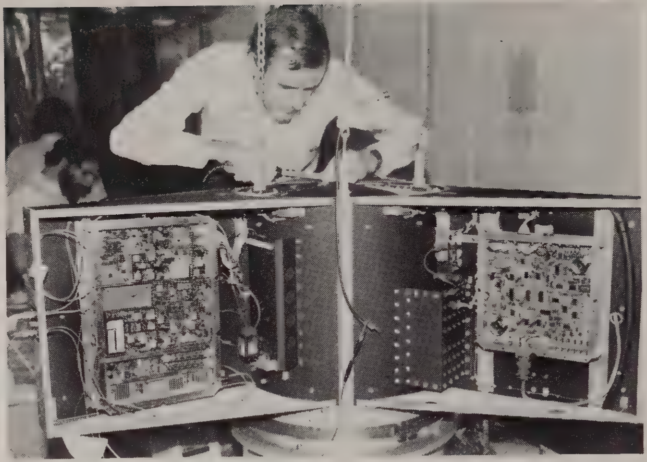


Fig. 9 — Phase IIIB shown in the open state. The L-transponder is shown at the left of the photograph.

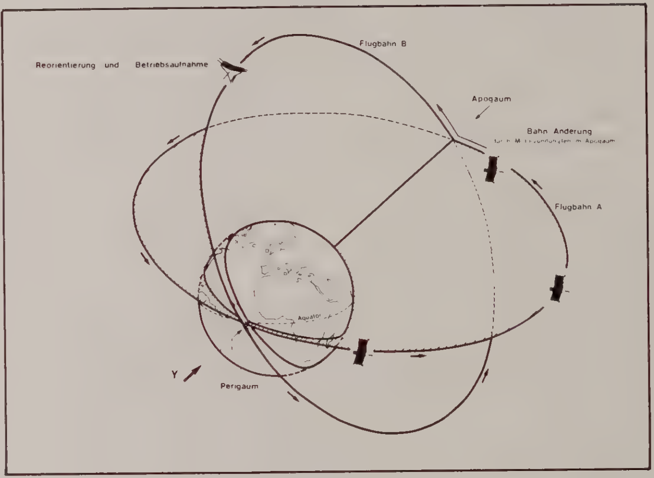


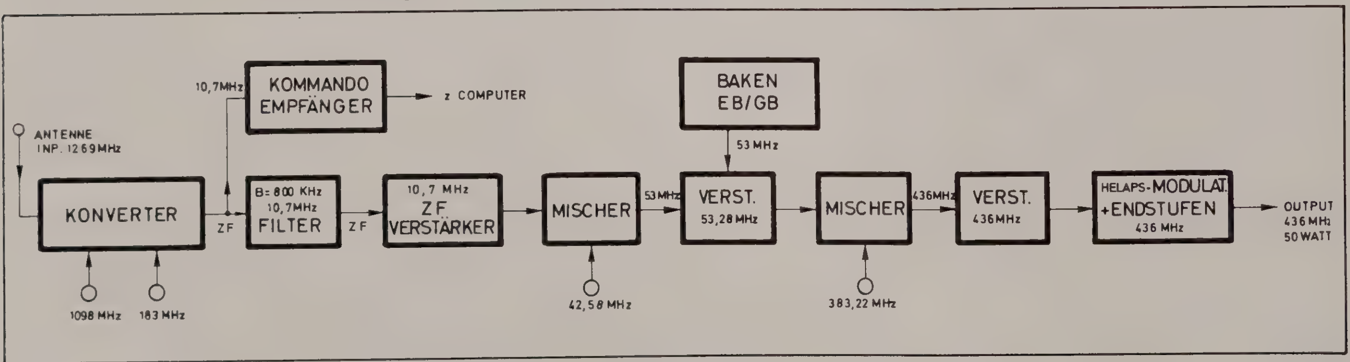
Fig. 8 — Phase IIIB reorientation and operation.

achieve flat response across the entire passband through the i-f amplifier stage.

The wideband linear i-f amplifier boosts passband signals by 40 dB. The following mixer stage converts the 10.7-MHz i-f signal up to 53 MHz. It is in this mixer that the two 436-MHz beacon signals are injected. Yet another mixer, this one with an injection frequency of 383 MHz, converts the linear 53-MHz signal to 436 MHz. Finally, a two-stage amplifier boosts the signal to 0.5 watts of driver power output. Signal disassembly, for the HELAPS modulation technique, takes place within the 50-watt PEP power amplifier.

The L-band command receiver makes use of the transponder's i-f stage, tapping some of the signal just prior to the 10.7-MHz filter. Following conversion, in a separate mixer, to 9 MHz and shaping through a crystal filter, the 24-cm command signal is processed by a dedicated 3-kHz bandwidth ssb receiver. The output is then directed to the on-board computer.

Fig. 7 — Simplified block diagram of the L-transponder.



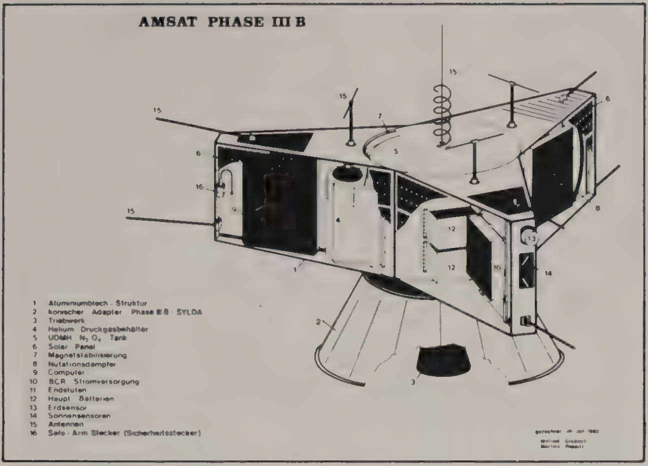


Fig. 10 — Schematic view of the Phase IIIB satellite.

Expected Transponder Frequencies

U-Transponder

Input: 435.025 MHz to 435.175 MHz
Output: 145.978 MHz to 145.828 MHz
Engineering Beacon: 145.987 MHz
General Beacon: 145.810 MHz

L-Transponder

Input: 1268.05 to 1268.85 MHz
Output: 436.96 MHz to 436.15 MHz
Engineering Beacon: 436.02 MHz
General Beacon: 436.04 MHz

Translation for Figure 3.
konverter: converter
mischer: mixer
kommando: command
empfanger: receiver
ZF: i-f
ZF-verts.: i-f amplifier
baken: beacons
zerlegung: decomposition, analysis
hullkurve: envelope curve
leistungsteil: high efficiency stage

Translation for Figure 4.
phasenanteil: phase component
verstarker: amplifier
sender: transmitter
endstuff: final stage

Translation for Figure 7.
z. computer: to computer

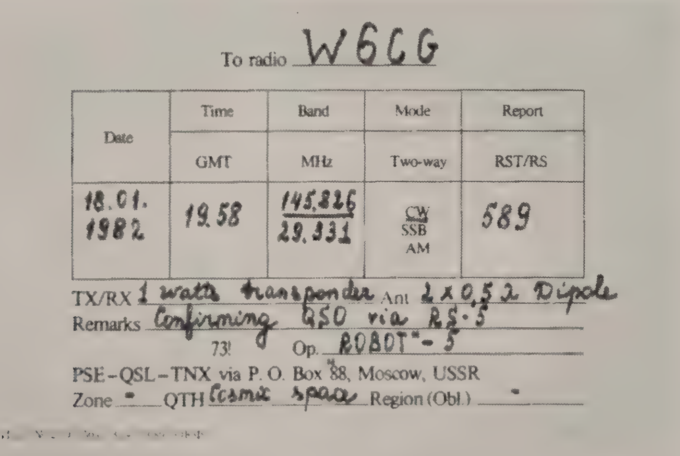
Translation for Figure 8.
perigaum: perigee
apogaum: apogee
reorientierung: reorientation
vor: before
motorzundung: motor ignition
nach: after
bahn-anderung: orbit alteration
tage: days
betriebsaufnahme: activity beginning (start of business)

Translation for Figure 10 with remarks.
(Editors note. The helix on the spacecraft should in fact show a right-hand helix; the drawing shows left)
aluminumbleck struktur: aluminum plate structure
konischer adapter: conical adapter
triebwerk: motor
druckgasbehalter: pressurized gas reservoir
magnetstabilisierung: magnetic stabilizers
nutationsdampfer: nutation dampner
BCR stromversorgung: battery charge regulator
endstuffen: final stages
haupt batterien: primary batteries
erdsensor: earth sensor
sonnensensoren: sun sensors
safe - arm stecker: safe/arm plug

Translation R. Gape

Comets

W6CG recently received his RS-5 Robot QSL. For all of us who have not received one, here's a look at Bud's card.



To radio W6CG

Date	Time	Band	Mode	Report
	GMT	MHz	Two-way	RST/RS
18.01. 1982	19.58	145,826 29,331	[✓ CW] SSB AM	589

TX/RX 1 watts transponder Ant 2 x 0,5 λ Dipole
Remarks Confirming QSO via RS-5
73! Op. ROBOT"-5
PSE-QSL-TNX via P. O. Box 88, Moscow, USSR
Zone - QTH Cosmic space Region (Obl.) -

Satellite Data Collection and Analysis

By Robert J. Diersing, N5AHD

Corpus Christi State University is a state supported upper level institution of higher education with an enrollment of approximately 3,400 students. As is the case at many colleges, the number of students seeking degrees in Computer Science is increasing at an astounding pace. There are currently nearly 200 undergraduate and another 200 graduate majors at CCSU.

Although the primary focus of the Computer Science program is one of business application design and implementation, there is an increasing need for more technical applications to be taught. Since one of the primary goals of the UoSAT project was that of promotion of interest and use by educational institutions, and since it is a very computerized amateur spacecraft, it seemed natural to include the study of the satellite as part of the Computer Science curriculum. The study of UoSAT would be particularly important in microcomputer application courses.

Even before the launch of UoSAT in September, 1981, the idea of assembling the necessary equipment was discussed with Dr. Allan Sugg, President of the University. The approval for the project was given and construction of the station was begun and continued through the fall semester of 1981.

Most of the construction activity took place on weekends and after normal working hours. Cables had to be run and a way to secure antennas to the roof without damaging it had to be found. Then with nearly everything in readiness, the spacecraft met with the lockup problem and all was on hold indefinitely. As all of us in the amateur spacecraft business know, it would be almost another six months before the spacecraft would be rescued through the efforts of Stanford Research Institute.

After the spacecraft rescue the idea of building a course around UoSAT surfaced again. During the fall semester, 1982, I decided to see if I could round up perhaps 3 or 4 people who would be interested in a directed study course involving UoSAT. There seemed to be sufficient interest and so the course was placed on the spring semester schedule. At the end of the registration period the 3 or 4 people turned out to be 11 including 2 faculty members. The class roster is included later on and shows the diversity of people interested in such a course.

Due to the excellent response there has been a request for a continuation of the course in the summer and fall terms. Hopefully, the fall course can be more oriented to data communications techniques and implementation using the PHASE-IIIB satellite. PACSAT will offer still another area for study.

On the one hand preparing to use such a resource as amateur radio satellites in an organized class might seem overwhelming and at times that is true. I rather consider myself lucky though, that through the efforts of so many other dedicated people, I have available a resource that is state-of-the-art which makes many concepts that are words in a textbook come to life for the students.

Course Content

Any time a completely new venture is undertaken one does not know exactly what goals to set. I did not want to make the goals for the class so high that they might not be attainable. Particularly not the first time around. Since the course should focus on the application of microprocessors both in space and on the ground, the following areas of study were identified:

Pointing out the DISC Meter. Equipment: Yaesu FRG-7700 with Hamtronics converters for two meters and 70 c. Surplus relay for switching separate antennas for RHC and LHC polarization (Cushcraft A-145-10T).

1. The application of microcomputers to the task of orbit prediction. Since much work has already been done in this area no programs need be written from scratch. This is, however, the first chance for some students to see the application of microcomputers to a computation-intensive task. Hopefully, some of the currently available orbit prediction software could be converted for use on previously unsupported machines by the students. Attention should also be given to conversion to languages other than dialects of BASIC.
2. The application of microcomputers to the graphical display of tracking and telemetry data analysis. Again there would be some emphasis on implementing this function on different machines.
3. Collection and analysis of telemetry data from specific experiments over a long period of time. This would be particularly suitable if some of the students already have an interest in an area addressed by one or more of the experiments.
4. The application of microcumputers to station equipment control. The experience to be gained from projects requiring hardware/software interaction would be invaluable to the students.

Even at this early date (February, 1983) some progress has been made in all of the above areas. As a matter of fact, some students will be continuing masters degree projects on related topics even after the course is finished.

A complete report on the progress and accomplishments of the class will be compiled and published during the summer, 1983.

Station Details

The description of the Corpus Christi State University UoSAT-OSCAR 9 telemetry data collection station follows:

Callsign: N5AHD/5
Location: 6300 Ocean Drive
Corpus Christi, Texas, 78412 U.S.A.
Latitude: 27.48N
Longitude: 97.24W

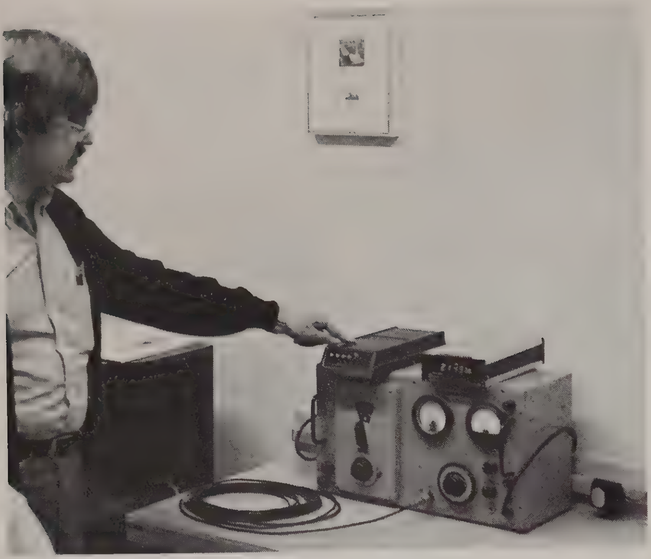
Antenna System

There are presently four antennas, 2 for 2 meters and 2 for 70 centimeters. The antennas are Cushcraft A145-10T and A435-20T respectively and each antenna of the pair is configured for opposite polarization senses, right hand circular and left hand circular. The azimuth rotator is an Alliance HD-73 and the elevation rotor is a Kenpro KR-500. A Lunar PAG-435 preamp is used on 70 cm. The weak point of the system is the RG-8 foam feedline which extends 125 feet down to the ground floor equipment location. There is no room to install hardline. All antenna equipment is mounted on a Rohn 25 short base section with a standard rotor-mounting top section. The base section sits on a standard roof mount that is bolted to eight foot cedar 4 x 4s which sits on the roof. The assembly is guyed three ways to pipes that extend through the concrete roof. The whole structure does not extend enough above the building to present any significant wind load. Guy wires also serve as hf antennas for the 15 and 20 meter bands.

Radio Equipment

The main piece of radio equipment is the Yaesu FRG-7700 receiver which is selectable between the hf antennas and two Hamtronics converters for 2 meters and 70 centimeters. This allows coverage of satellite frequencies as well as hf frequencies for AMSAT nets,

UoSAT decoded telemetry frame is shown.



1200 BPS Modem, Hayes clock and signal generator to be sure everything is up to speed.

WWV, and later hf beacon experiments. Switching between the RHC and LHC antennas is provided by surplus relays from aircraft service. These relays are rated to 1.2 GHz. A discriminator meter has been added to the FRG-7700 as a tuning indicator. HF transcieve capability is to be added at a later date.

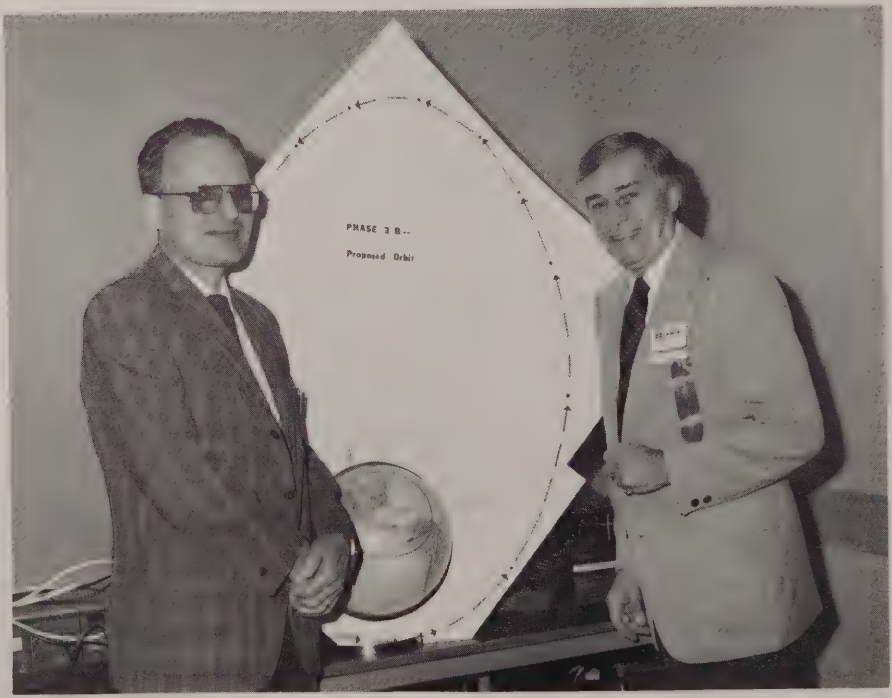
Computer Equipment

Telemetry can either be tape recorded or processed online or both. A Novation 4202 modem is used for demodulation. The data can then be captured via the serial interface of a Cromemco System Z-2D or an IBM Personal Computer. Both of these systems are equipped with double sided double density five inch floppy disks and have at least 64K of RAM. A Heath H-19 terminal is used on the Cromemco and a NEC RGB display is used on the IBM PC.

Computer Programming

The telemetry data is captured and saved on disk by assembly language programs, Z-80 in the case of the Cromemco and 8088 in the case of the IBM PC. The data is then run through an edit program after which identification is added indicating the date, time, orbit no., telemetry mode, and beacon frequency. The data can then be displayed and/or printed in one of several forms. Displays or hardcopy printouts can be made of spacecraft status and decoded telemetry. The telemetry for a given channel or combination of channels can be displayed graphically on both systems. Programming for orbit prediction, data editing, and telemetry decoding is done in PL/I-80. Programming for graphic displays is done in BASIC but will probably be converted to Fortran in the future.

Comets



The Orlando, Florida Hamfest this year was a giant success. Two who helped make it possible are shown here at the AMSAT Booth: WD4FAB (left) and W0CA.

QRZed the Wyoming Station, Did You Say Mobile?

By Andy MacAllister, WA5ZIB

Yes I did! Satellite mobile doesn't have to be as improbable or difficult as it sounds but it does require a little bit more effort than tossing a handie-talkie in the front seat, firing up the engine and heading for the hills.

My interest in mobile and portable work dates from my first days on OSCAR 8 when I discovered just how exciting satellite QSO's were. However, it seemed like I needed a lot of complex radios and accessories to make contacts. Portable work seemed like it would be a lot of trouble and mobile efforts appeared to be out of the question. I could hear OSCAR 7 Mode B in the car and had monitored QSO's through it from offshore drilling rigs in the Gulf of Mexico, but 100 watts of ERP on 432 MHz was out of my reach and omni antennas were a "must".

Then one day things changed. While doing some ragchewing through one of the ten new 'RS' birds, I noticed that my ground mounted vertical out in the back yard on the end of 100 feet of moldy coax was receiving better than my 10 meter beam! This came as quite a surprise to me but under the circumstances, with my vhf antennas at 30 degrees elevation, I began to believe it possible. I continued to make comparisons between the vertical and the other antennas. The final verdict was that a quarter wave whip on a car might be a realistic 10 meter antenna if the receiver were up to the job.

Field Day '82 was about a week away and no plans had been agreed upon by any of my cohorts in the 435 Club of South Texas so I decided to give it a try on my own with 'RS' satellite mobile. First, though, I would have to find out if my satellite radios could work together in my station wagon.

The TR-9000 went into the slide mount with the 90 watt amplifier on the floor of the passenger side. The Yaesu FRG-7700 general coverage receiver was propped against the seat just under the 9000. The 10 meter preamp was physically tied to the receiver's input. My preamp is a simple but highly effective dual gate MOSFET design from the *ARRL Handbook*. A preamp makes a tremendous difference, especially for mobile work. I already had a Larsen 5/8 wave whip for 2 meters in the middle of the car's roof and one of the two ball mounts on the rear was pressed into service for a "chopped-down" 11 meter whip. A few clip leads finished the temporary installation and everything was powered without sparks or blowing fuses. The power amplifier was communicating directly with the receive system but it turned out that the problem was in the power lead routing. I ended up putting the receiver and preamp on a shielded cable directly to the battery and left everything else hooked up through the car's fusebox. Now with the noise blanker energized on the receiver, no problems were encountered for cw or ssb at the full 90 watts output on 2 meters.

After working on my new set-up most of an afternoon, I had things in order just in time for a good RS-8 pass. KR6B was my first mobile QSO with K5ADQ close behink. A third one was made with WA8YJE. It looked like the project was going to work! I spent the next few days listening to RS-6 and 8 on the way to work in the mornings and made some more mobile contacts. Most of the QSO's were made while stationary at the office due to engine noise from my vehicle and others. Power line noise became an important factor also.

Satellite operations from the mobile in Los Alamos, N.M. Left to right, Heather, WB5RMA (XYL of WA5ZIB); Nikki, K5ADQ; Bill, WA5VQH; Tom, W5QVZ.

Field Day came along and I was in the car ready to go. As usual, however, here came "Murphy" in the form of bad weather and terrible 10 meter "atmospherics." I drove around South Houston looking for a quiet spot to make QSO's and had little luck. A few difficult exchanges squeezed through and Saturday did yield one bright ray of sunlight amid the storms. After overloading my ears listening to lightning crashes in the passband of RS-6, I decided to monitor RS-5 and see if the robot was pasing out numbers. Sure enough, there he was just coming up over the southern horizon with plenty of signal strength and calling "CQ." I looked down at the straight key I had strapped to my knee, decided not to think about the odds, and started calling. On the third try there it was, "WA5ZIB DE RS5." I was so excited I almost forgot to copy the QSO number! Sunday had more reasonable atmospherics and the result was 16 QSO's all via RS's 5, 6 and 8. Some of the contacts on Sunday were actually made while in motion on the road. It was a good first effort at satellite mobile but there were better things yet to come!

Several factors tempted me to make a DXpedition to Wyoming. First, on the day of the demise of OSCAR 7, W0VO and KE0T were scheduled to put a portable Mode B station on the air from Cheyenne. I never forgot that one. Then Doug, KO5I, had recently made two fine portable efforts from Arkansas. Dan, W5VVR, pointed out to me that Estes Park, Colorado, the theoretical "apogee" of my upcoming vacation, really wasn't that far from the Wyoming state line. And finally, my wife, WB5RMA, hadn't made any really loud noises about my proposed excursion. So I plugged in the TRS-80, gave it some latitudes and longitudes for my proposed temporary QTH's along the road, and packed the car. At least I would keep in touch with my favorite hobby while on vacation and whether or not I got to Wyoming, the satellite gear was going for another ride.

On the first day out I was delighted to find that OSCAR 8 sounded very nice on my simple system. Two QSO's on a horizon pass were quite satisfying. I promised to pay more attention to this bird. Our first major stop was Los Alamos, New Mexico, for visiting, sightseeing, trail bike riding, and of course satellites. During a visit to the home of Tom and Nikki Boyd, W5QVZ and K5ADQ, I let it slip that I might be going to Wyoming for a day. Before they would let me leave, I had left an absolute itinerary with them including orbit numbers. They asked me if I had any plans to go to Vermont, but I had to pass on that one! I was going to be in Wyoming on July 15th one way or another, hopefully chasing satellites.

The next several days of vacation prior to the 15th were great fun both in Los Alamos and at the YMCA camp near Estes Park, Colorado. The location of our cabin at the "Y" camp had such tremendous power line noise, however, that it was necessary to drive down the road a bit each time I wanted to catch a pass. I took every opportunity to spread the word about the upcoming expedition.'

The night of the 14th, sleep was a bit elusive. I was thinking about the last Wyoming effort a year earlier. All of my electronic boxes were still apparently intact and the car was still running quite well but I felt like a mountain climber leaving from his last camp for the summit of Everest. I decided this was being a bit dramatic although I still wondered what delights Murphy and his minions had in store for me.

The 15th dawned with the standard crispness and clarity of Colorado mornings. I loaded a cooler with some diet soft drinks and sat back to contemplate my computer printouts for Cheyenne, Wyoming satellite passes. While I was putting the cooler in the car, the phone rang. Apparently there had been a major flood through parts of downtown Estes Park as a result of a dam breaking up in the Rocky Mountain National Park. My FRG-7700 and TR-9000 were brought back into the cabin to monitor the local AM station and 2 meter repeater for news. At first things sounded bad but later in the morning, as everyone became more organized, a better perspective of the disaster was possible. I decided to go ahead and try for Wyoming but promised to do what I could later in the day for the volunteer ham efforts.

I had originally calculated that the drive to the Wyoming state line would take two hours so I gave myself three before the first pass of the afternoon. On my way out of the "Y" camp I turned on all the boxes to see if they still worked. Curiously, the preamp seemed to be attenuating rather than amplifying. The fate of last year's DXpedition once again floated through my mind. I hoped it was a minor gremlin but at least I was sure that Murphy didn't know about my back-up preamp so I just kept going. At the first roadblock the police were detouring all traffic to the south (to avoid downtown Estes Park) on some route (not on my map) called Mary's Lake Road. I was beginning to wonder about the fact that I was going the wrong way to get to Wyoming when I came to the second roadblock. This time it was the Forestry Service and they wanted to know where I was going. When I said "Cheyenne" they pointed to a dirt road about 50 feet in front me and said to follow it to the main highway. I didn't bother to look for this one on the map. I knew I hadn't seen anything called Fish Creek Road on there! The third roadblock was protecting the east end of the city but I was clear of the problem now and headed for Wyoming.

At a filling station in Fort Collins, I tore apart the preamp in hopes of a quick fix. A few diagnostic procedures showed the cute little dual gate MOSFET to be a four legged metal bug of no electronic value. I don't usually stock such items in my car and this time was no exception so I tossed it under the seat, rerouted some cables and turned on the back-up preamp. I was delighted to see that it was intact but was not impressed by the gain or its immunity to my 2 meter amplifier. I guess they didn't have satellite work in mind when they designed my hf "bi-linear." It did the job when I first discovered the wonders of OSCAR 8 but now it would have to answer a more demanding call after 2 years of inactivity. Back on the road again with a cool soda in hand, I was watching the mileage markers when I noticed lightning flashes in the distance. A few quick guesstimations yielded severe atmospherics somewhere in the neighborhood of Cheyenne. Well, Murphy was at least going to get a good fight! I crossed the state line 15 minutes before RS-3 was due to peak over the hroizon so I took some pictures of the "Howdy you're in Big Wyoming" sign, pulled up the road a few hundred yards, put on the headphones and got ready for some fun.

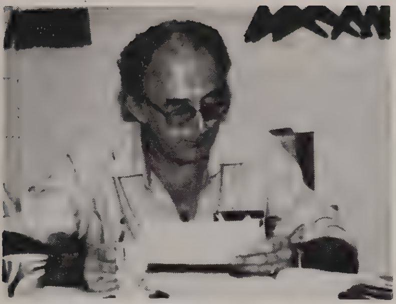
RS-3 sounded great between the static crashes so my spirits were doing well. Next came RS-5. The telemetry said the transponder was off so I tried the robot but my fist just wasn't quite up to the job. The desense on my "Boomer RX-50" preamp had me worried a bit but when RS-6 showed up I forgot my problems and started making contacts. Finally I was in a rare QTH with QSO's from N2AA, W8DX and W5QVZ to get things rolling. Thirteen contacts on the far eastern passes of RS-6 and RS-8 sounded like a good score to me and I was beginning to laugh at Murphy and his petty efforts to squelch my enjoyment.

I drove around Cheyenne in between passes looking for food, souveniers, and electronically quiet places to stop the car and chase satellites. My earlier difficulties seemed minor now and the lightning storms were moving off to the east. After about 28 QSO's I was getting physically tired, but I was still full of nervous energy. While I was sitting behind a motel and munching on a K-Mart submarine sandwich it dawned on me that the receiver was inordinately quiet. Murphy had gotten my back-up preamp! I just about choked on a pickle while I frantically started flipping switches and pulling on cables. I knew Murphy had to have done this one personally because it was just too sinister. I had always thought of Murphy to be big like me but somehow he had gotten through all those little BNC connectors to the heart of my last preamp. You just can't work satellites with a mobile whip and a general coverage receiver! With that idea in mind, I barely managed 2 difficult contacts with W9JI and a very patient KH6IBA.

YMCA Camp at the Rockies near Estes Park, Colorado.

I had 2 more available passes before my planned departure from Wyoming: one on RS-8 and another on OSCAR 8. I had about 20 minutes to figure out how to make satellite QSO's without a preamp. After some deep thought over this new kink in my plans the solution came to me while driving around the suburbs. I was out of spare boxes so I would just have to get really optimistic and listen harder. It seemed like a good idea at the time since it was my only alternative. Now with my new attitude, I managed 4 contacts on RS-8 and netted 5 stations on the OSCAR 8 pass. I finished the day with KG5E, KO5I and KB3ZS along with a feeling of accomplishment.

The ride back to Estes Park, and south Texas a few days later, was uneventful and satisfying. Wyoming netted 39 satellite QSO's in one afternoon all the way from Greenland to Hawaii and my vacation score was near 100 contacts from beginning to end. Murphy had tried hard but my own idea that "it will be done" finished first this time. Don't be surprised if you hear a mobile "5" on Phase IIIB. A few more radio boxes and antennas might just make it.


G3IOR

Worldwide Satellite Activity

By Pat Gowen,* G3IOR

"PACKSAT!"

The vast number of satellites audible in early 1983 could bring a new interpretation to the terms "Pack" and "Jam" suffixed by Sat". Not only were RS's 3, 4, 5, 6, 7 and 8 regularly appearing, but we had good old faithful 'OSCAR 8' still going strong. For good measure, the superb effort by the team at WA6LET brought UoSAT-OSCAR 9 back to us, and OSCAR 7 was heard frequently too. 'ISKRA-III' was on and active for a time, and if this was not enough even 'RS-1' and 'RS-2' were being heard and even used! Who would have thought, ten years ago, that no less than twelve amateur-radio satellites would be logged on a single day! No prizes are offered for the first member to hear OSCAR's 1 to 6!

RS

All of the 'RS' series from 3 to 8 have recently been tested out by command station RS3A, and all were found to be in excellent condition, with no signs of battery degradation detectable. The third system aboard the satellites normally used as a link between command stations has been regularly active on 'RS-6' and 'RS-7', providing an additional channel for use. The 'RS-6' service channel is some 4 kHz wide, with an uplink of 145.850 MHz, and a downlink of 29.350 MHz, plus and minus Doppler, and tends to run into a continuous carrier at times if speeds greater than fifteen w.p.m. is sent through it. 'RS-7' has a much narrower passband, needing constant Doppler correction and can normally take forty words per minute cw. All of the 'Radio' satellites have the same service channel combinations of 145.850/29.450 MHz. Despite the fact that the channel works similarly to the 'ROBOT', some interesting research is possible into path attenuation, as one's own relative signal strength may be read on the 'S' meter of the service channel receiver (the presence of the attenuator pad noted) plus the power output all given on the satellite telemetry.

On the subject of the 'RS' telemetry, some changes are required to the tables given in this column over a year ago. Pre-launch alterations were made and since indicated by the eventual publication of the telemetry in *RADIO* magazine of the USSR. We originally understood that the 'E' prefix, the extra 'dit' that turns the first 'K' into 'EK', 'IK', to 'SK', etc, was an indication of satellite activation, i.e. the transponder was on. It is now known that the added dit is heard when the satellite has its command receiver activated by the command signal uplink, during which time the transponder may be on, off, or at any pre-change state. The indication of the transponder being on is a positive value on the 'K' channel that commences each frame, or, of course, signals on the downlink.

The 'G' prefix on channel one, previously a zero-level indicator, is now a service parameter that is employed by the command station to ensure correct reception of any particular instruction sent as when the receipt is positive, a number that corresponds to that command is indicated following the 'G'.

The 'U' line will not always read a positive value, as the gas-pressure of the hermetically-sealed pressurized sections of the satellite are not present on all of the series.

The 'S' meter readings given on 'IU', 'IS' and 'IW' (or 'SU', 'SS' and 'SW' when under command) are not calibrated to any standard. (Even if there was one - Hi!) The readings are relative so they cannot be employed for any absolute field strength at the satellite. Nevertheless they give indications of the variable under study. 'IW'/'SW' refers to the 145.850/29.350 MHz channel; 'IS'/'SS' to the 'ROBOT' Rx; while 'IU'/'SU' to the main receiver aboard.

The QSO number given by the 'ROBOT' supplied on channel 'MD' or 'WD' when under command supplies the serial number of the actual batch prior to re-setting and not the all-time number of QSO's made which now amounts to many thousands. The heater radiation control power given by 'MO' or 'WO' may be either employed automatically in the satellite or put on and off by ground station command. This permits experimentation with the temperature within the environment as indicated by other channels such as

DC9ZP Antennas

DC9ZP

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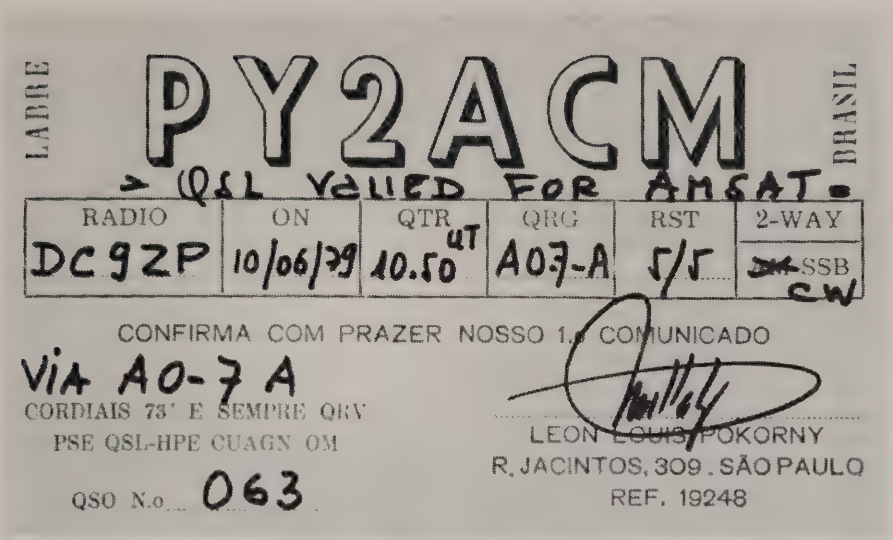
*17 Heath Crescent, Hellesdon, Norwich, Norfolk, NR6 6ND


LABRE PY2ACM BRASIL

→ QSL VALIED FOR AMSAT.

RADIO	ON	QTR	QRG	RST	2-WAY
DC9ZP	10/06/79	10.50 UT	AO7-A	5/5	~~2x~~ SSB CW

CONFIRMA COM PRAZER NOSSO 1.º COMUNICADO

VIA AO-7 A

CORDIAIS 73' E SEMPRE QRV
PSE QSL-HPE CUAGN OM

QSO N.o 063

LEON LOUIS POKORNY
R. JACINTOS, 309 . SÃO PAULO
REF. 19248

the 'N' or 'R' prefixed frames. The 'MG' or 'WG' line earlier asserted to be the input power of the robot is now known to be the actual output power of the robot in milliwatts.

Finally, at long last, we have learned of the frame prefixed by 'N' or 'R'. These give some interesting physical data of value to those considering the thermo dynamics of solar effects in vacuuo.

Third channel: prefix N or R

Letter Content	Calculation
K Transponder output power	0 2xN² transponder output in milliwatts
D Total solar panel output	50N Solar current in milliamps
O 1st solar panel temperature	2 7(N-26) = Temperature in °C
G 2nd solar panel temperature	2 7(N-26) = Temperature in °C
U 3rd solar panel temperature	2 7(N-26) = Temperature in °C
S Equipment structure temperature	0 8(N-5) = Temperature in °C
W Hermetically-sealed section gas temperature	0 8(N-10) = Temperature in °C

The telemetry is the same for all six satellites of the series, although the birds themselves are not alike in structure, content, or total function. The system is based on a 35 channel two-step analog computer which in turn switches 31 points of on-board apparatus. The supply is only 1 mA resting current from a 9V source with 5 mA drawn at the actual moment of measurement lasting 200 milliseconds. The system was designed and built by Alexander Papkov to whom, with LZ1AB and UA3CR, we are obliged for this information.

Should any new member require a copy of the updated telemetry, a self-addressed envelope with return postage ($1.00 will suffice) sent to G3IOR/QTHR marked "RS TLM" will ensure an immediate return.

At the turn of the year, DOSAAF members left Moscow to go /MM via CX, VP8 South Georgia to Drooshniya Base, on the coast of Antarctica by the Weddell Sea, 77°S, 40°W, to conduct a series of experiments using the 'Radio' satellites.

'RS-6' and 'RS-8' had their beacons put to the lower passband edge to permit QRM free FM in the upper part of the passband, and 'RS-7' was put to ROBOT and service channel use to permit 'RS-5' to act as a message codestore conveyor for the expeditions QTC's back to base. The first QSO by the four 4K1 prefixed stations was between 4K1CR and KC4AAA, a first Antarctic to Antarctic QSO, dated 6 January '83.

'RS-1' and RS-2' are both being heard again after a long absence. It is assumed that an event similar to 'OSCAR-7' has occurred, in that the batteries are open circuit, and when illuminated, the solar panel is energizing the satellites, producing on RS-1 a corrupted telemetry for about one minute out of every four while a panel is in sunlight. Expert Satellite SWL Birger Lindholm, AMSAT LM-728, has produced many frames, which tell us that the letters are sent as '5' producing a '55' callsign for 'RS'. 'RS-2' sends '55' twice, and still has an effective transponder possibly due to its positive power budget (resulting from much larger solar panels). W6ELT confirms that his observations of both satellites tally with his long-term predictions for them.

'ISKRA' is Russian for 'Spark' and the first satellite, ISKRA-1 came up on 5.1 GHz on 10 July 1981. 'ISKRA-2' we all followed, and all was reported in a recent *Orbit* magazine. 'ISKRA-3' was launched, like its predecessor, from SALYUT 7 by hand, and this time the 21 to 29 MHz repeater was able to be commanded on. It had it's share of problems, as the emitter of the Beacon P.A. was running a very high current, producing high temperatures for the satellite, and thus could only be put on intermittently for about one day in four to permit re-charging. The 'ISKRA' series are not really intended for communications, but are to evidence the development efforts of the team of students working at the Moscow Aviation Institute where at least ten more satellites will be stabled. Some are intended for higher orbits but not all will be in the amateur bands. Many QSO's were made via 'ISKRA-3' prior to its burn out at 1802 UTC on 26 December '82 over Southern Europe. It's life, despite a marginally higher orbit and consequently longer period than 'ISKRA-2', was much shorter ceasing at a 85 minute final period. The propagational aspects were very interesting. The satellite was quite audible over the Antipodes and up to twenty minutes sub-horizon. Yet between elevation angles of −1° to +25° it could rarely be heard. At elevations of 38° and up it was extremely strong with a marked Doppler that permitted easier tracking. The next 'ISKRA' is due toward the end of December '83 and will be an amateur-radio version again.

As we write 'OSCAR-8' is showing signs of aging in one of it's battery cells. K9CIS reports that where as before the battery was capable of withstanding dual-mode operation for twenty hours before any noticeable voltage drop, the period for joint 'A' and 'J' mode in mid-January '83 was only a few minutes before the voltage fell. The Mode 'J' frontier continues to be pushed back by the stalwarts with GM4IHJ, G4CUO and G6ADC all getting deeper into USA. David, G4CUO reports recent QSO's with W4AUZ, N4AR, W8DX, and W9HR. Heard for 20 seconds, but not worked, was N0AN! Dave sends a plea for East Coast W's, e.g. W1 and W2 not to call on passes emanating from between 231° to 235° EQX, as this very narrow window is vital for the more western stations. All orbits from 230° to 235° are good for G:W/VE DX, and occur monthly.

News from Sub-Satellite points:

G4CUO, who employs four sloping dipoles around his mast for a 29 MHz downlink RX antenna has been putting it to good effect on Mode 'A'. He has recently worked K5ADQ (New Mex.), W7AG (Ariz.), AI0Z (Colo.), W0EOZ (S.Dak.), W0KAV (Neb.), K5FVA (La.), W6VPH (Cal.), K5DHU (Tex.), W4DAQ (Ala.), VE7DOX (BC), W0SL (Mo.), W7AVD (Mont.), and W7UMJ (Ore.) as well as Nevada and Wyoming. An understanding XYL Margeret, is very tolerant of Dave's enthusiasm for nocturnal Oscaration.

AMSAT-SM has embarked upon a program with numerous Schools and Colleges in co-operation with the Educational authorities. The series will include Antenna pointing, orbital calculations, mechanical antenna mounting, demodulation of UoSAT, ASCII programs, data taking, each for its own group. Work will commence soon on a PACSAT system for future deployment.

HP1AC, Cam, is the only station on the satellites from Panama and runs cw only with a TX62 plus Heath HG10 VFO to a 5 element Cushcraft twister on 145 MHz with a TA33jr for the 29 MHz downlink on a Collins 75S-1 plus homebrew FET pre-amp. A homemade W7US helix is used for Mode 'J' reception. So far, 405 first QSO's have been logged, with 38 US states and 11 Countries, including ZP9, HC1, OA4, HK3, FM7 and YV2. Cam worked VP2MM on Mode 'A' by both RS-6 and 8, but has had no luck with the PY's and LU's heard to date. He too backs G6RH's idea of a mainland WAS, as KH6 and KL7 are much too far for him to reach although hope exists for some of the W7 states needed.

JA8DXB, Sada, writes from Hokkaido that he has heard DL9ZAD, DL1CF and DJ6RX, but only DC9ZP has been worked for the first DL/JA QSO. He is looking for DL, PA, HA, OE, ON and YO for a QSO on orbits emanating from EQX's of 275 to 285°W. To date Sada has made 2,300 QSO's with 36 countries in 4 continents with his Mode A TS-700GII TX to a pair of F9FT 16-element Yagis, with a TA33 fed 3SK4O pre-amp to a TS83OS Rx. Check for Sada on

29.420/470 MHz RS6/RS8 cw and 29.440/29490 MHz ssb. JA8FXB, JH8MTE, JA7IE, JH7CKF, JG1JIQ JA9BOH and JA9YAP are also looking for DX QSO's.

Alex, VP2MM, reports the first cross-Montserrat QSO between himself and Errol, VP2MO on the West side of the island. Alex was VP2MBC back in 1978 when your author was so pleased to work him for a first. Despite regular activity Alex has yet to hear a signal from South America on the birds!

Dom, N1DM, writes from R.I. to clarify my interpretation of his QSY from that rare state in the earlier *Orbit*. He still maintains his station at his parents home and in fact is updating it for Phase III, from whence he operates still. In addition he is on from Boston, Mass., signing N1DM/1 in order to differentiate. Dom is not able to make definite schedules for Rhode Island QSO's as he did in the past due to sporadic visits, but when there, signing N1DM without the stroke 1, he will do his level best to give as many QSO's as possible. New activity is anticipated soon.

Adolf, OX3WS, is now the only active station in Greenland, and probably the only source of Europe for WAC SAT for many of the West Coast Stations. He has issued a special 'Diploma' testifying to a contact with him for a single QSO which is available for the QSL agreeing with his log-entry, 3 IRC's, sent to Box 264, DK3900, Godthaab, Greenland. The award is printed in black on blue cartridge paper and makes a handsome wall adornment.

UA0BBN is very active from Cape Chelyuskin, Zone 19, for those who need Asia for WAC. Since benefitting W0CA with the Worlds first Satellite WAC, he has been actively QSO'ing many W's and Europeans usually between 0900 to 1300 some 15 kHz from the lower edge of the Mode 'A' passbands. QSL's via P.O. Box 88, Moscow, USSR.

Nikki, K5ADQ, and husband Tom, have been putting a splendid signal into Europe from New Mexico, usually on 29.422 and 29.472 MHz Mode 'A' cw on most every available pass and time. Nikki is anxious to QSO F, EA, SM, LA, PA, DL, ON and anywhere further into Europe.

Jack, G4JJ, is very anxious to receive Telemetry of any Satellite around the World, to assist the studies that he is making into the charging, heating, and degradation of the satellites relative to the ratio of solar-illumination and darkness. Jack's predictions of the status of the satellites, including the current problem on AO-8, have proved to be very accurate.

On a sadder note, Dx-ponents will have missed the very regular and reliable activity of Bob, G6RH recently. Bob has had a minor heart-attack, the control of which is not miscible with the excitement that we all know Bob achieves from his DX satellite activities. We look forward to hearing G6RH again on those DX paths when we shall all know that he is mending fast.

No more for this issue. Please send your details, score, DX worked, stations heard, propagational anomalies, photographs, etc. to G3IOR to help swell the incoming and hence outgoing news.

W6 SPACE PHILOSOPHER

By John Browning,* W6SP

During a lecture in 1871, Ralph Waldo Emerson said, "If a man can . . . make a better mousetrap than his neighbor, though he builds his house in the woods, the world will make a beaten path to his door." The large number of times Emerson has been quoted (and misquoted) over the years, is testimony to the wisdom of his declaration. There is a wide market for improved techniques in certain basic functions. Although Emerson preceded ham radio, his thoughts are relevant to the current status of amateur satellite development.

Observation of the characteristics of the general ham population reveals that the vast majority went to the trouble of obtaining a license for a single purpose—to be able to talk on the radio to other hams. This situation has a logical basis. If one's interest is strictly in electronic construction, no license is required. If the motivation is in experimentation with improved communication techniques, then on-the-air testing is essential. But most of us are ordinary operators who remain intrigued with the magic of using invisible electromagnetic radiations to exchange our random thoughts across continents while positively controlling the process with our own send-receive switches.

Characteristically, hams are specialists. Among others, there are DXers, contesters, teletypers, trafficers, ragchewers, *and* experimenters. The latter like to *achieve* through accomplishment of the difficult. They press the limits of capability by eking out a maximum-range contact from a Radio Sputnik or by plucking signals from weak reflections from the moon's surface. Generaly, it's a bit like the ambitious fellow next door who gets a lot of satisfaction from running twenty-six miles before breakfast. His neighbors are impressed but there isn't much in it for them. He isn't even fun to watch!

But sometimes experimenters make better mousetraps which are quickly appreciated by the neighbors. A classic in the annals of amateur radio is the January 1948 issue of *QST*. One article, "Single-Sideband Operating Tests" by O.G. Villard, Jr., W6QYT, was introduced as follows: "On the evening of September 21, 1947, the 75-meter 'phone band was the scene of a contact that well may have signaled the beginning of a revolution in amateur radio-telephony, for this was the first amateur work with single-sideband suppressed-carrier transmission. Since then the transmissions of W6YX (Department of Electrical Engineering, Stanford University) have given many the opportunity to try out the technique of receiving single-sideband signals." In his editorial in the same issue, K.B. Warner, W1EH, mentioned the potential advantages of narrower bandwidth, elimination of carrier hetrodynes, unintelligibility of nearby interfering signals, and more efficient transmitters. He correctly concluded: "Everything points to single-sideband becoming the accepted amateur method in the near future. Condition yourself to the thought, and we'll supply practical information as rapidly as possible."

Until now, amateur satellite operations have reposed in the experimental, hard-to-do category; of mild interest and minimum utility to the general ham population. Are we about to experience a sudden change of attitude? The neighbors are aware of the goings-on in the house in the woods of suburban Maryland. Within future months magazine editorials may tout the advantages of smaller, less conspicuous antennas, new DX frequency band availability, and reliable propagation. Unlike the situation which prevailed at the birth of amateur sideband, practical information and commercial equipment are readily available for application to high-altitude satellite utilization. "Standby one" for Phase IIIB, Mr. Emerson!

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Around the World

By Kaz J. Deskur,* K2ZRO

Remember the stories about long-delayed echos, LDEs? Amateurs and commercial radio operators claimed to hear their own QSO's repeated on the air several minutes after they stopped transmitting. There were even occasional reports that WWV time signals were substantially *late*. This phenomenon was first noticed in the early Twenties soon after long distance short-wave communication became popular. Sporadic reports of LDEs have appeared in amateur publications ever since.

Explanations proffered for this rare and baffling "anomaly" ranged from the quasi-plausible to the totally bizzare. Some proposed that ducting caused radio signals to circle the globe hundreds or thousands times before the signal "escaped." Others suspected that extra-terrestrial beings set up repeaters either on the moon or in space to establish communication with the earthlings.

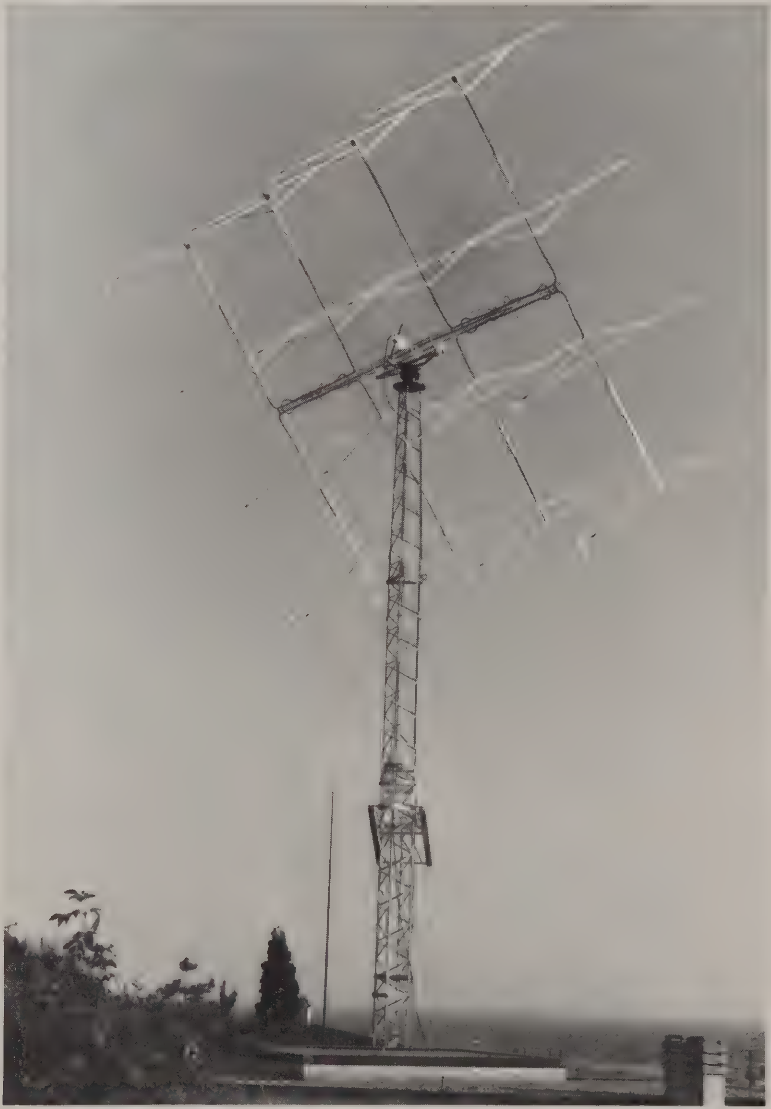
Now the riddle has been solved by Robert Freyman, formerly employed by Los Alamos National Laboratory. He proposed that occasionally radio signals become trapped in a conductive duct of plasma created by the solar wind. The duct extends to troposphere where it blends with the geo-magnetic field. Radio signals in this region may enter the duct and be propagated towards the sun. In most cases these signals escape into space. If, however, the plasma duct collapses, the signal becomes reflected, returns to earth and can be heard again often with a considerable time delay. Russian scientists studied Freyman's theory and succeeded in confirming experimentally that his theory is correct.

Mr. Freyman was awarded the Commemorative Medal of Polar Geophysical Institute for his discovery by the U.S.S.R. What does the Polar Institute have to do with LDEs? Apparently this phenomenon is most common for signals originating in the polar region, where the magnetic field of the earth and the solar wind plasma blend most efficiently. Thus the comprehensive study of LDEs can best be conducted at high latitudes which is obviously within the scope of interest of the Soviet Polar Institute.

Dave Ingram, K4TWJ, describes in Feb. 1983 *73 Magazine*, the procedures and hints for working Robots on the RS series of satellites. In addition, he offers entry-level general information regarding communications via amateur satellites that includes description of basic required equipment, antennas, etc. The article is apparently intended to "whet the appetite" of those that have yet to work the satellites.

British *Radio and Electronics World* May 1982, publishes the do-it-yourself receiver for reception of UoSAT satellite, written by Graham Leighton. It is essentially a relatively simple multi-channel, crystal controlled, 2m receiver consisting of an FET preamplifier and mixer, followed by the "receiver-on-the-chip" MC 3359/ULN 3859 and solid-state audio amplifier.

The unique feature of this design is the means for compensation of Doppler shift. An AFC control signal, derived from the MC 3359, is used to change the capacitance of a varicap connected in series with the crystal of the first mixer oscillator. The author claims that with this method, AFC range of ±15 kHz can be obtained. (Ed: Presumably, the received signal must be relatively strong to produce reliable AFC correction).



I2ODI: 144 MHz array, 16 X 20 elements for a gain of 26 dB.

**Box 11, Endicott, NY 13760*

AMSAT News

Organizational items of interest to all members of the Radio Amateur Satellite Corporation

PACSAT Design Meeting Held

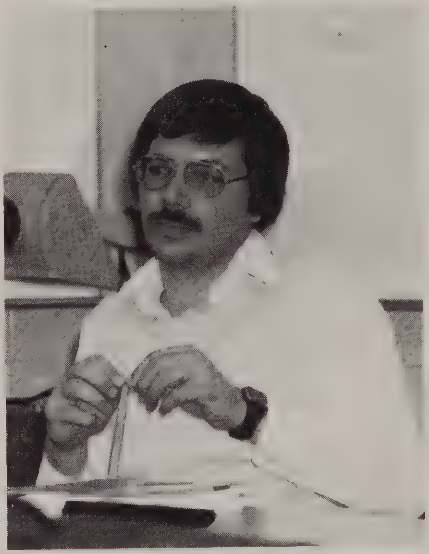
A kickoff meeting to begin the design phase of PACSAT was held at the Goddard Space Flight Center, Greenbelt, Maryland on 25-27 February. The meeting attracted attendees from as far as England and California.

Called the PACSAT Conceptual Design Meeting, the discussions got under way Friday evening with more than 15 in attendance. Two special guests were presented to the group which included senior managers from AMSAT, AMRAD, TAPR, SLAPR and others. (TAPR is Tuscon Area Packet Radio and SLAPR is St. Louis Area Packet Radio.) The special guests were Mr. Henry Norman and Mr. Robert Reining of VITA, the Volunteers In Technical Assistance. Mr. Norman, who is VITA Executive Director explained that VITA is a 4,000 member organization devoted to the application of technical solutions to problems in underdeveloped Third World nations. For example, VITA has been active in developing wind energy electric systems for rural village electrification.

Mr. Norman explained that VITA was interested in a PACSAT-like satellite to reduce the international communications problems incurred in supporting VITA field operations and for responding to technical inquiries from remote villages where help is needed. The store-and-forward concept appears a viable solution Mr. Norman added.

A high degree of commonality would exist between an amateur radio PACSAT-device and a satellite built for VITA. In fact, it was pointed out that the overall design would be virtually alike. Thus, the design of one would fill the needs of both organizations. VITA has advanced $15,000 in a grant to begin the design conceptualization of PACSAT.

WA2LQQ at PACSAT meeting.



PACSAT Project Manager KD2S.

Dr. Martin Sweeting, G3YJO, UoSAT Project Manager, suggested the possibility of his group at Surrey working in the area of spacecraft development, structure, bus systems and mechanical requirements.

Leading the weekend meeting, PACSAT Project Manager Den Connors, KD2S, discussed the ties between AMSAT and TAPR. He discussed the roles of PACSAT, research and development, gateway stations, user networks and interconnectivity.

Paul Rinaldo, W4RI, who will be moving to head the ARRL Technical Department, said he will be bringing a new awareness of digital technology with him to Newington.

The weekend's agenda was then detailed and agreed upon. Jan King, W3GEY, discussed launch opportunities for the next several years. He cited possibilities including Delta/D (1985), Shuttle (1984-1989), Landsat Recovery mission (1986), Space Services International (1985) and the Japanese H-1 (1986). Jan emphasized the significance of being allowed to deploy a satellite from a Shuttle-borne GAS (Get Away Special) canister called a GAS Can. This possibility is being pursued with NASA by various interested parties including AMSAT. Jan also elaborated on a fascinating scheme he and Karl Meinzer, DJ4ZC, devised to use water as a propellant to take a small payload from a Shuttle (very low) orbit to a more useful one similar to AO-8 or even as high as AO-7. One version of the Meinzer/King strategm would use an electric powered steam jet generator to boost the satellite orbit in small spurts over a period of weeks or months. The advantage of this, Jan pointed out, was that the extremely tight safety requirements associated with a manned mission (such as Shuttle) could more easily be met with a safe propellent such as water. The alternative would be to propose the use of various rocket propellants. These would be much more difficult to qualify and thus much more expensive, Jan said. The steam generator idea will be carried forward.

The discussions then moved to issues involving legal, regulatory, fiscal and management matters. The importance of electronic mail systems was discussed as was the importance of the adequate utilization of available AMSAT talent.

The meeting then turned to the "proof of concept" experiment to advance two of AMSAT's fundamental objectives: 1. Utilization of low earth orbits and 2. Use of inexpensive satellite technology. It was remarked that it might be both possible and desirable to use existing UoSAT capability to demonstrate the store-and-forward concept. Mr. Norman indicated that there was a very large potential interest in the PACSAT concept and that all available communications channels should be used to generate interest and revenues. These should include using Voice of America to explain the concept and generate interest around the world. Problems involving thrid party agreement constraints were discussed and it was pointed out that the proof of concept should be (could be) coordinated with certain key United Nations agencies to generate favorable publicity and support both in the United States and abroad. Internal communications were discussed as well. *Thanks* Amateur Satellite Report.

G3YJO

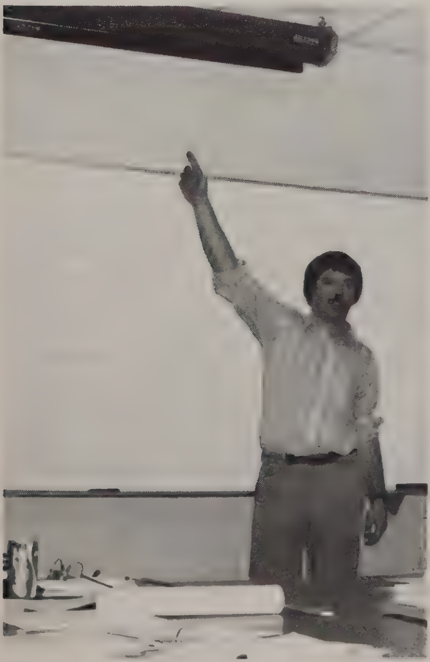
KP4AA of Rio Piedras, PR has been generating much AMSAT interest on the islands as Chief Area Coordinator for Puerto Rico.

AMSAT Hires General Manager

After a search process lasting nearly 8 months, AMSAT has selected William L. Lazzaro, N2CF, of New York to be its new General Manager. The position also carries the title Executive Director.

The process of selection a GM/ED began with the Spring 1982 Board of Directors Meeting when the Directors authorized that a search committee be established to hire a qualified individual. The search committee was constituted in July with committee persons M. Saragovitz, W3IWI, K4YV, K1HTV, W6SP, KB4ZJ, W3GEY and WA2LQQ serving. AMSAT Treasurer Roy Rosner, K4YV, served as Chairperson. Advertisements were placed in major amateur radio magazines and newsletters. Other ads appeared in major newspapers. By November scores of resumes had been received. Finally, each committee person, acting independently, selected his top ten candidates from among all the resumes. A half dozen consensus candidates were interviewed in Washington. A group of three finalists was chosen and negotiations with the prime candidate, N2CF, began in January. In early March a majority of the Board ratified the agreement and N2CF thus became the second General Manager in AMSAT's history.

KD2S demonstrates fundamental satellite location technique.



N2CF is a New York native in his early thirties, is married and has three boys. He holds an Extra ticket, has been licensed since 1964 and active on OSCAR since 1978. He is currently Activities Manager of the Orange County (N.Y.) Amateur Radio Club.

Bill holds a B.S. cum laude in Science Education and was President of his college honor society. In addition he earned a Masters in Science Education and has 30 post Master's credits towards his Doctorate.

ASR recently interviewed N2CF to learn more about the plans, programs and philosophy he brings to the office.

ASR: How did you first become aware that AMSAT was looking for a General Manager?

N2CF: A ham friend pointed out an ad in the October '82 *QST* which, he said, appeared as if it had been written precisely for me. So I read it and it seemed like a pretty good match.

ASR: What do you mean, "A good match"?

N2CF: The job description just sounded as if it were describing me....what I do best. For example, my profession in science education meshed well with the requirement to develop programs in OSCAR education. My experience in obtaining federal grants to aid in my school science curriculum paralleled the requirement for fund raising ability. I had been a key leader in local amateur radio clubs which exemplified my ability to lead volunteer groups. Most of all, however, I believe my talents as a businessman squarely addressed the job description's requirement to manage the business aspects of AMSAT.

ASR: Could you elaborate on the grants you obtained for science education?

N2CF: Over a period of 4 years I won 3 federal grants to improve science education in the classroom. Two grants were directly associated with space awareness themes. The first in 1977 provided an OSCAR receiving station. Later in 1978 I won a second grant to establish a weather fax station in the school. These were important in providing the students with a deeper, more tangible understanding of the concepts taught.

ASR: Do you see any benefits to AMSAT in your ability to win grants?

N2CF: Yes indeed! I see as one of my primary functions the task of winning grants for AMSAT to finance our on-going programs in space awareness and amateur satellite work. There are literally thousands of foundations across the country with money to donate to good causes. You just have to know how to apply for it. Moreover there are corporations with millions of dollars earmarked for organizations such as AMSAT. My plan is to move into this area promptly to develop this yet-untapped reservoir of financial resources. Secondarily, I will be looking towards individuals who have a particular interest in amateur radio and who may be able to give us some support. I personally know of several who might be convinced, given the correct approach, to writing rather large checks in favor of AMSAT. Primarily, though, I will be looking outside the amateur radio community for support; to the foundations and corporations. We will also be looking at some programs that could be self-sustaining; self-supporting so that they would not draw down existing resources. In this category we might fit OSCAR education through grants, AMSAT-developed software, certain aspects of the new PACSAT program and an envigorated trinket program. All these I see as contributing to the sustenance of AMSAT....our ability to finance our ambitious projects.

ASR: As General Manager will you be responsible for all these programs?

N2CF: Some projects I will oversee and others I will manage directly. But as I understand my responsibility, I will manage the overall effort with the help of key individuals throughout the organization.

ASR: Does your employment agreement provide an incentive for you to develop these revenue-producing programs?

N2CF: Part of my compensation from AMSAT is an incentive based on the donations and grants I obtain for AMSAT. Being a salesman at heart I'm delighted to have such an arrangement. It makes me strive even harder to obtain what we all want: a fiscally strong AMSAT. I will be launching several of my programs immediately upon taking office next month.

New AMSAT GM: N2CF.

ASR: What plans do you have to take advantage of the launch of Phase IIIB to build AMSAT membership?

N2CF: I plan to use the core of AMSAT Area Coordinators in conjunction with W8GQW's proposed local network base to bring AMSAT's message to the large metropolitan areas in particular as soon as possible. We will transmit a basic, beginner's program on repeaters throughout the country to bring 15 or 30 minutes per week of OSCAR education to as many amateurs as possible. We may even take it one step further to where we promote affiliated clubs. The implication is clearly that exposure to the ideas will breed interest and interest will lead to new members.

ASR: What are your feelings on the balance between providing a stable satellite communication resource and advancing the state of the art?

N2CF: I believe we will always want to provide communications satellites for a vast number of users. By the same token, we have an obligation in our charter to pursue advanced modes and new technology. I'm particularly excited about PACSAT. I think it will influence amateur radio's future as much or more than Phase IIIB.

ASR: Why is that?

N2CF: PACSAT will open many doors in terms of ham radio's relation to rapidly growing computer technology. I'd like to see amateurs move into this area and to really take advantage of the possibilities that exist. The conjunction of these two technologies will determine in large measure the course of amateur radio henceforth, I'm convinced. It's therefore very prudent that AMSAT should be in the forefront.

ASR: How do you see AMSAT organization on an international scale?

N2CF: I look forward to supporting the AMSAT President in developing closer cooperative ties with the several affiliated AMSAT organizations. I believe the time is right for expanding on the strong bonds that already exist and hope that cooperative projects to build and launch spacecraft grow even stronger with the enlarged capability now evident in several countries.

ASR: What are your plans for relocating to the Washington area?

N2CF: For the first few months I will be splitting my time between the Washington office and my office in New York. This will allow me to begin my familiarization with the operation in Washington, to get several programs running while allowing me to tend to the business of preparing for a permanent relocation of my family. In addition, I will need to work with WA2LQQ to familiarize myself as much as possible with aspects of the publications end of AMSAT. I will be meeting with W1XT, KW2U, KB2M and others in the next month or so. In any case I will be permanently relocated in the D.C. area by summer, we hope.

ASR: As our General Manager do you plan to make presentations to amateur groups?

N2CF: I hope to be quite active and to travel widely to bring interesting presentations to groups around the country. I feel there is a real need to get out with a presence and bring our story right to club level. I want to help educate the amateur radio community to Phase IIIB and to share the excitement I feel about amateur satellites with all those who will listen.

ASR: When do you start work?

N2CF: April 25 I will be at work.

ASR: Will we see you at the Dayton Hamvention this year?

N2CF: Without a doubt! I look forward to it with great excitement.

ASR: Well congratulations, Bill, on your new job and we know all the AMSAT members are pulling for you. Do you have any closing remarks?

N2CF: The General Manager's position is a dream job for me. I couldn't have designed a more challenging, exciting circumstance myself! In the months ahead I look forward enthusiastically to meeting as many of the members as possible and to get their ideas too as to how best to make use of the opportunities that lie ahead. I want to encourage members to participate at the highest level they can and to help shape the organization for the exciting times that lie just ahead. AMSAT is one of the most significant forces in amateur radio today. I hope to advance our collective ideals and bring AMSAT to new heights of success in both building spacecraft and promoting the fun and educational aspects of using them. And I look forward to working with you all in making these positive things come about starting right now. Thanks!

ASR: Thank you, Bill.

Thanks Amateur Satellite Report

Board Meeting Minutes Continued from *Orbit* No. 12

In discussing publications the Board heard that *ASR* is a no-cost, self-funding enterprise now endorsed by ARRL. *Orbit* magazine has, since its inception, failed to pay for itself as planned. WA2LQQ explained the root of the problem as being inadequate readership levels. The *Orbit* concept was based (3 years ago) on having the magazine generate sufficient advertising revenues to offset fully the cost of publication so that no monies would need flow from the treasury to the magazine. However, since the expected influx of new members attending the launch of Phase IIIA didn't happen, the cost per-reader-reached to a potential advertiser has been much higher than comparable magazines (e.g. *QST, 73, CQ, HR,* etc.). Without advertising revenues, AMSAT's choice has been to either make up the difference form the treasury or scrap the magazine until membership levels improve. The latter option would present an improved cost picture to the prospective advertiser. The Board decided that *Orbit* should continue through without interruption despite the additional costs involved because of the keen member interest in the magazine despite its schedule/production delays. Six issues were budgeted for 1983. The Board then heard that the difficulties in maintaining the 1982 schedule were largely attributable to overload of one or two key individuals. WA2LQQ then explained that there were three new editors coming on-line early next year to help relieve the tremendous workload. N1DM, W4OWA and KB2M will be "in training" over the next few months.

The Board then turned to the election of officers, the establishment of new offices and the ratification of appointments.

Reelected W6SP Chairman

Elected KA9Q Secretary to the Board

Reelected W3IWI President

Reelected WA2LQQ Executive Vice President

Elected K8OCL Senior Vice President (a new position)

Reelected W3GEY Vice President/Engineering

Reelected K1HTV Vice President/Operations

Reelected K9LF Vice President/Special Projects

Elected KO5I Assistant Vice President/Ops for Spacecraft Operations (new position)

Elected W0RPK Assitant Vice President/Ops for User Services (new position)

Elected W2FPY Assistant Vice President/Eng for Research & Development (new position)

Elected KD2S Assistant Vice President/Eng for Spacecraft Engineering (new position)

Elected KA9Q Assistant Vice President/Eng for Systems Analysis (new position)

Reelected K4YV Treasurer

Ratified KD2S PACSAT Project Manager, W2RS Chairman, Management/Finance Committee, W1HDX Manager of Ground Station Development.

A statement for the record was entered by W3GEY stating that the Board's rationale for instituting the new offices was to facilitate the transition of responsibility to new hands in an orderly manner. Jan regretted the appearance of bureaucracy that might result from the creation of the new slots. (W3IWI, W3GEY and K1HTV indicated their desired to "retire" in the next several months.)

The Board declined to act to add two new chairs to the Board to bring the total number to 9.

Special recognition of the Board of Directors was extended to KA5EIM, W4OWA, KD6DG and the SRI team, W8GQW. K1HTV will communicate the Board's appreciation.

The meeting closed with a playing of an audio tape recording of greetings from AMSAT UK Secretary G3AAJ. The meeting was adjourned at 16:15 Sunday.

South American Chief A.C. Tapped

Carlos Huertas, LU4ENQ, AMSAT Area Coordinator for Argentina has been named Chief AMSAT Area Coordinator for South America. Carlos has also agreed to serve as AMSAT Phase IIIB Special Service Channel Coordinator for that continent.

LU4ENQ will join the growing number of Phase IIIB Bulletin Stations who will be using the Special Service Channels (SSCs) after the satellite goes into its operational phase. Transmissions from LU4ENQ will be primarily in Spanish with a target audience of Radio Amateurs in South and Central America as well as the islands in the Caribbean. These transmissions will use information received via satellite from the Phase IIIB General Beacon as well as from other Bulletin stations and will include news of Radio Amateur Satellite matters, radio propagation, DX and other information of general interest to the Spanish speaking community. Assisting Carlos, LU4ENQ, will be AMSAT members, LU8EIC and LU8DYF.

Carlos is a contributing editor for the Spanish language ham magazine *REVISTA*, the monthly publication of RCA, the Radio Club of Argentina. He writes a monthly column on VHF and satellites, providing the latest info on these matters to interested hams in LU land. When not at work (IBM Argentina) Carlos uses his TRS-80 Color 32K computer to perform AMSAT related chores such as generating orbital data for monthly publication in *REVISTA*, transmitting BASIC satellite programs on FM-AFSK on the LU AMSAT Net, keeping a FILE of satellite users and local area coordinators, making mailing labels for local radio clubs as well as a number of other computer tasks. Congratulations and thanks to Carlos and his dedicated assistants — *K1HTV*

Thanks Amateur Satellite Report

KA9Q answers questions at recent PACSAT Meeting in the Washington area.

Event Celebrates Radio Revelation

Fifty years ago a young radio engineer working in Holmdel, New Jesdey announced a discovery that would ultimately change man's understanding of the entire universe. Over a period of four years Karl G. Jansky, while trying to identify radio interference sources, came to the revolutionary finding that a mysterious hiss at 20.4 MHz actually originated from the galactic center; the Milky Way!

His revelation gave birth to the science of radio astronomy. Using modern equipment scientists can "peer" at radio frequencies virtually to the "boundaries" of the known universe some 12 to 15 billion light years distant.

Now scientists and technicians at the National Radio Astronomy Observatory at Green Bank, West Virginia plan to commemorate the 50th Anniversary of Jansky's discovery. Amateur Radio operators around the world will be able to participate using their home stations to communicate with various commemorative stations established at Green Bank.

The commemoration will occur on two consecutive weekends in May. On May 7-8 Amateur Radio station K8HUH will operate on the Amateur 15-meter band using Jansky's reconstructed antenna. Frequencies of operation will be: 21.03 and 21.13 MHz cw and 21.36 MHz ssb.

On the subsequent weekend, May 14-15, an even more exotic Amateur Radio event will transpire. Stations around the would will be invited to communicate with a huge radio telescope "dish" at Green Bank by bouncing signals off the moon. A super-specialized art in Ham Radio, only about 1% of all hams have both the skill and equipment to succeed using the tenuous earth-moon-earth (EME) path. Signals were first bounced off the moon just after World War II by a powerful radar in Massachusetts. Hams have been doing it on various vhf and uhf frequencies since the mid-fifties. The NRAO event will use 70-cm EME signals. Because of the tremendous sensitivity of the 140-foot dish to be used at Green Bank, quite modest Amateur stations will be able to communicate with distant stations far beyond their normal radio range (horizon) at uhf. As little as 1000 watts effective radiated power (ERP) should be adequate according to AMSAT President W3IWI, Dr. Thomas A. Clark, himself a NASA Radio Astronomer and avid EME proponent.

According to Dr. Clark, "This EME opportunity should provide many. . . uhf enthusiasts with a unique opportunity to work a rare state and to test their station hardware in advance of the Phase IIIB launch." Tom points out that the 1000-watt ERP level is about what will be required to use Phase IIIB, Mode B. As little as 200 to 400 watts ERP could be used for cw with good results.

The EME schedule is as follows: 13 May/22:00 UTC - 14 May/01:15 UTC; 14 May/12:00 UTC - 15 May/02:15 UTC; 15 May/12:45 UTC - 16 May/03:30 UTC.

A total of 31 hours of activity is scheduled. Participating Amateurs associated with NRAO will be WB4ZJO, N4HTL, K8HUH, W3IWI, KA8QIJ, WA1UAB, N4FWA, K2AOE, VK2BMZ, N4HTK, W4OZJ, KA8NQR, W8MIF.

Thanks Amateur Satellite Report

New Sked For AO-8 Announced

AMSAT OSCAR 8 Operations Manager W9KDR has announced a revised schedule for AO-8 effective immediately. The new schedule calls for Mode A on (UTC) Sundays, Mondays and Tuesdays, Mode J on Thursdays, Fridays and Saturdays. On Wednesdays AO-8 will be in recharge mode with even the beacon turned off for better charge rate.

AO-8 will be five years old on 5 March 83. There has been concern voiced recently about the overall battery condition. (*ASR* #51) AO-8 Command Stations W9KDR, W3HV, K3NW and W6CG as well as observer K9CIS have been closely monitoring battery condition as it is reflected in telemetry channel 3 according to W9KDR.

For several years AO-8 has been in dual AJ Mode twice a week. Although this provides a very heavy load, the strong battery in conjunction with careful monitoring has provided a maximum of satellite usefulness according to W9KDR. Now, with battery aging evidenced, more prudent power budgets are sought. The new schedule reflects the new realities together with an implicit recognition of the preponderance of Mode A time afforded by the several Radio Sputniks now operational.

"It's not generally known, but Mode J actually draws more power than Mode A." suggested Bernie Glassmeyer, W9KDR, from ARRL HQ recently. "In the past, when the batteries were new, we could live with dual AJ, but those days are over for the forseeable future," addded W9KDR. "Our aim has been to strike a balance of service between Mode A and J but always with the health of the spacecraft uppermost in our minds. And though we presently don't see a great threat to the spacecraft, we want to assure its continued service by careful operations planning," Bernie concluded.

Launched from Vandenberg AFB, California on March 5, 1978, AMSAT OSCAR 8 has made over 25,000 orbits in nearly 5 years in orbit traveling 722 million miles (nearly four round trips to the sun) at an average velocity of 16,700 miles per hour!

Thanks Amateur Satellite Report

ARRL Taps AMRAD President For Technical Slot

ARRL General Manager Dave Sumner, K1ZZ, has told *ASR* that Mr. Paul Rinaldo, W4RI, has been selected to become ARRL's new Technical Editor of the *QST* staff. He will replace the retiring Doug DeMaw, W1FB, in early May. Paul will report directly to K1ZZ who, in addition to being ARRL General Manager, is Editor of *QST*.

Paul has had a distinguished career in advanced Amateur Radio circles and is currently President of AMRAD, The Amateur Radio Research and Development Corportion, a non-profit scientific/educational corporation. He also edits the AMRAD newsletter as well as *QEX*, ARRL's new advanced experimenter's newsletter. Paul has been an AMSAT Life Member almost from its founding (LM-36) and is an ardent advocate of Amateur Radio satellites.

Among the seemingly endless accomplishments Paul has to his credit are experiments in spread spectrum (under an STA) and packet radio development including a key role in the recent AMSAT-sponsored PACSAT meetings which resulted in new standads (AX.25) for Amateur Packet Radio protocol. He has published several articles in Amateur Radio journals. Professionally Paul has recently been a consultant to computer and networking concerns.

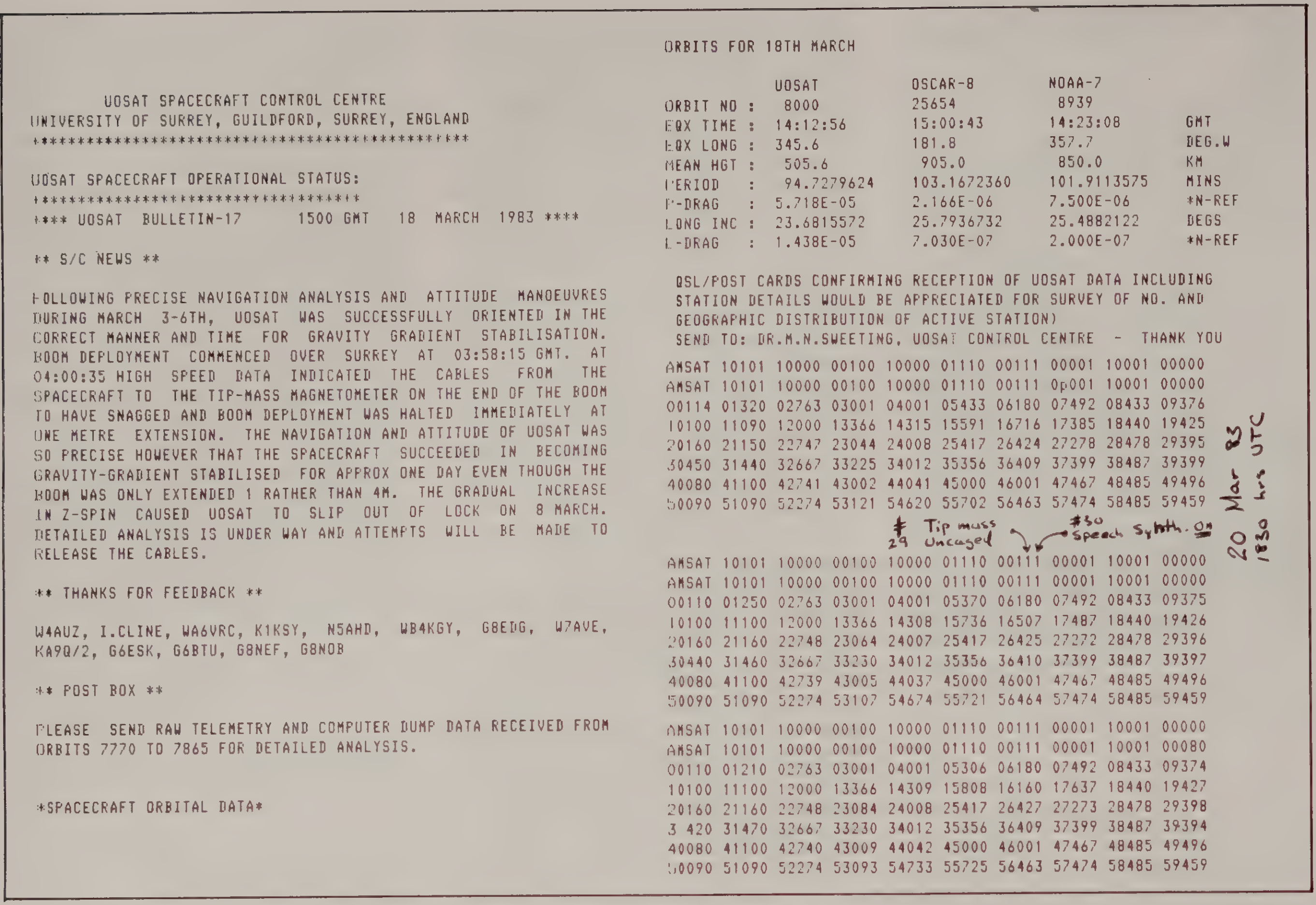
In a recent telephone interview with *ASR* Paul expressed "continued enthusiastic support for AMSAT. I hope to further the close ties especially in the technical area, between ARRL and AMSAT. I plan to further emphasize satellite communications in ARRL publications."

A landmark survey conducted by Florida State University for ARRL in 1979 indicated a strong predeliction of Amateurs for digital communications and personal computing. In selecting W4RI to head ARRL's technical department, *ASR* believes a major coup has transpired. It is hard to conceive of a more deft choice given the inevitable "digitization" of Amateur Radio in the next decade! Well done!

Thanks Amateur Satellite Report

**Did You Renew
Your Membership Recently?**

Your Support IS needed!



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       UOSAT SPACECRAFT CONTROL CENTRE
UNIVERSITY OF SURREY, GUILDFORD, SURREY, ENGLAND
************************************************

UOSAT SPACECRAFT OPERATIONAL STATUS:
************************************
**** UOSAT  BULLETIN-17      1500 GMT   18  MARCH  1983 ****

** S/C NEWS **

FOLLOWING PRECISE NAVIGATION ANALYSIS AND  ATTITUDE  MANOEUVRES
DURING MARCH  3-6TH,  UOSAT  WAS  SUCCESSFULLY  ORIENTED IN THE
CORRECT MANNER AND TIME  FOR  GRAVITY  GRADIENT  STABILISATION.
BOOM DEPLOYMENT  COMMENCED  OVER  SURREY  AT  03:58:15 GMT.  AT
04:00:35 HIGH  SPEED  DATA  INDICATED  THE  CABLES  FROM  THE
SPACECRAFT TO  THE TIP-MASS MAGNETOMETER ON THE END OF THE BOOM
TO HAVE SNAGGED AND BOOM DEPLOYMENT WAS HALTED  IMMEDIATELY  AT
ONE METRE  EXTENSION.  THE NAVIGATION AND ATTITUDE OF UOSAT WAS
SO PRECISE HOWEVER THAT THE SPACECRAFT  SUCCEEDED  IN  BECOMING
GRAVITY-GRADIENT STABILISED  FOR APPROX ONE DAY EVEN THOUGH THE
BOOM WAS ONLY EXTENDED 1 RATHER THAN 4M.  THE GRADUAL  INCREASE
IN Z-SPIN  CAUSED  UOSAT  TO  SLIP  OUT  OF  LOCK  ON  8 MARCH.
DETAILED ANALYSIS IS UNDER WAY AND ATTEMPTS  WILL  BE  MADE  TO
RELEASE THE CABLES.

** THANKS FOR FEEDBACK **

W4AUZ, I.CLINE, WA6VRC, K1KSY,  N5AHD,  WB4KGY,  G8EDG,  W7AVE,
KA9Q/2, G6ESK, G6BTU, G8NEF, G8NOB

** POST BOX **

PLEASE  SEND RAW TELEMETRY AND COMPUTER DUMP DATA RECEIVED FROM
ORBITS 7770 TO 7865 FOR DETAILED ANALYSIS.


*SPACECRAFT ORBITAL DATA*
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ORBITS FOR 18TH MARCH

             UOSAT          OSCAR-8        NOAA-7
ORBIT NO :    8000          25654           8939
EQX TIME :   14:12:56       15:00:43       14:23:08       GMT
EQX LONG :   345.6          181.8          357.7          DEG.W
MEAN HGT :    505.6          905.0          850.0         KM
PERIOD   :    94.7279624    103.1672360    101.9113575    MINS
P-DRAG   :   5.718E-05      2.166E-06      7.500E-06      *N-REF
LONG INC :   23.6815572     25.7936732     25.4882122     DEGS
L-DRAG   :   1.438E-05      7.030E-07      2.000E-07      *N-REF

 QSL/POST CARDS CONFIRMING RECEPTION OF UOSAT DATA INCLUDING
 STATION DETAILS WOULD BE APPRECIATED FOR SURVEY OF NO. AND
 GEOGRAPHIC DISTRIBUTION OF ACTIVE STATION)
 SEND TO: DR.M.N.SWEETING, UOSAT CONTROL CENTRE  -  THANK YOU

AMSAT 10101 10000 00100 10000 01110 00111 00001 10001 00000
AMSAT 10101 10000 00100 10000 01110 00111 0p001 10001 00000
00114 01320 02763 03001 04001 05433 06180 07492 08433 09376
10100 11090 12000 13366 14315 15591 16716 17385 18440 19425
20160 21150 22747 23044 24008 25417 26424 27278 28478 29395
30450 31440 32667 33225 34012 35356 36409 37399 38487 39399
40080 41100 42741 43002 44041 45000 46001 47467 48485 49496
50090 51090 52274 53121 54620 55702 56463 57474 58485 59459

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3 420 31470 32667 33230 34012 35356 36409 37399 38487 39394
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29 Tip mass Uncaged

#30 Speech Synth. On

20 Mar 83 1830 hrs UTC

A Message from UoSAT Headquarters.

Big ARRL Donation Boosts Fund Drive

ARRL Foundation President Robert York Chapman, W1QV, has presented AMSAT Chairman John Browning, W6SP, with a check for $20,000 to help in financing AMSAT's Phase IIIB spacecraft. At a recent meeting in Los Angeles Mr. Chapman presented the check which comprised $10,000 from the Foundation and an additional $10,000 voted by the ARRL Board of Directors. In recent years ARRL support of AMSAT's Phase III Program has amounted to nearly $100,000 raised by ARRL through its members and through matching funds.

ARRL's donation comes at a propitious time. "Although the annual renewal campaign is rejuvenating our depleted coffers, the ARRL input is most welcome and will certainly balance a further draw down on reserves as we approach the Phase IIIB launch campaign," remarked AMSAT Executive Vice President Vern "Rip" Riportella, WA2LQQ. "January is always the leanest month since renewals are just beginning to appear, the big campaign at Dayton is months away and end of year bills have arrived. The timing could hardly have been better," added WA2LQQ.

ASR expresses the sincere thanks of all AMSAT members and amateur space advocates for the continued, enthusiastic support AMSAT enjoys from ARRL!
Thanks Amateur Satellite Report

Phase IIIB's L-band transponder will give hams access to an orbiting microwave link for the first time (1269 MHz uplink and 436 MHz downlink). Although many hams are just now discovering the joys and challenges of those bands above 1 GHz, microwave communication is by no means new. In some cases, it even preceded much of the experimental work on the hf bands.

How long has microwave communication been practical? Longer than most of us think. On February 11th, England's Marconi Communication Systems celebrated the 50th anniversary of the world's first commercial microwave link—from the Vatican to the Pope's summer residence at Castel Gandolfo. The 15-mile link was installed during the autumn and winter of 1932 and 1933 and was inaugurated on February 11, 1933. The Marchese Marconi himself demonstrated the system to Pope Pius XI.

The Vatican's microwave link followed several years of experimentation by the company's Propagation Section at Chelmsford, England and by Marconi at his private laboratories in Italy. An 11-mile link near Genoa in October 1931 provided the first practical demonstration. An experimental duplex telephone link, spanning about 22 miles, was built the next year.

K9CIS checks out his famous installation. See *ORBIT* No. 8.

AMSAT

Radio Amateur Satellite Corporation
P. O. Box 27 Washington, DC 20044

BYLAWS OF THE RADIO AMATEUR SATELLITE CORPORATION

Article I — "Name and Definition"

Section 1

The name of this organization shall be: Radio Amateur Satellite Corporation (AMSAT).

Section 2

The organization shall be a non-profit scientific corporation, incorporated in the District of Columbia.

Article II — "Purposes and Objectives"

Section 1

The purposes and objectives of the Radio Amateur Satellite Corporation are:

A. To provide satellites that can be used for amateur radio communication and experimentation by suitably equipped amateur radio stations throughout the world on a non-discriminatory basis.

B. To encourage development of skills and the advancement of specialized knowledge in the art and practice of amateur radio communications and space science.

C. To foster international goodwill and cooperation through joint experimentation and study, and through the wide participation in these activities on a noncommercial basis by radio amateurs of the world.

D. To facilitate communications by means of amateur satellites in times of emergency.

E. To encourage the more effective and expanded use of the higher frequency amateur bands.

F. To disseminate scientific, technical and operational information derived from such communications and experimentation, and to encourage publication of such information in treatises, theses, trade publications, technical journals or other public media.

Article III — "Membership, Dues and Privileges of Membership"

Section 1

Membership shall be open internationally to any person or group indicating an interest in supporting the purposes, objectives and activites of the Corporation. An applicant for membership shall complete an application form and membership shall become effective upon receipt of membership dues.

Section 2

There shall be two classes of members. The designation of each class of member, the qualifications and rights of the members of each class and their voting rights are as follows:

A. A *Member* shall be a person who demonstrates interest in furthering the goals of the Corporation by filling out an application form and paying his annual dues. A Member shall have the opportunity to participate in the activities of the Corporation, to hold office and shall be entitled to one vote for each position to be filled in the elections for the Board of Directors.

B. A *Member Society* shall be a recognized group, club or organization which particpates constructively in the activities of the Corporation. To attain the status of Member Society, the organization shall submit a Member Society Application form signed by an authorized officer of the organization. A Member Society shall be entitled to nominate two Members as candidates for the Board of Directors of the Corporation.

Section 3

Member dues per annum shall be twenty-four dollars ($24.00) in the U.S., Canada and Mexico, and twenty-six dollars ($26.00) elsewhere. Dues for each additional member of the immediate family shall be two dollars ($2.00) per annum. Annual dues for Member Societies shall be fifty dollars ($50.00) per organization. Organizations which become members in the first year of activity of the Corporation shall be designated "Charter Member Societies". Senior citizens over 65 and students under 18 years may apply for AMSAT membership at ¾ of the full rate. Life Memberships are available for a one-time fee of 25 times the appropriate annual rate. Dues may be waived on an individual basis at the discretion of the Board of Directors. A minimum of one renewal notice shall be sent to Members and Member Societies at least sixty days prior to expiration date.

Article IV — "Elected Officers Committees, Appointed Officials and Their Responsibilities"

Section 1

The general policies of the Corporation shall be established by a Board of Directors.

Section 2

The Board of Directors shall consist of seven Members of the Corporation. The Directors shall be elected by the Membership at the annual meeting for a two-year term. Four Directors shall be elected in odd numbered years; three shall be elected in even numbered years. The Directors shall assume office immediately upon election.

Section 3

The Board of Directors, at their first meeting following the annual meeting, shall elect the Corporate Officers. Newly elected officers shall assume their respective offices immediately upon their acceptance. The retiring officers shall be responsible for assuring the effective transfer of records and responsibility to the incoming officers.

Section 4

Officers of the Corporation shall be the President, Executive Vice President, Vice President - Engineering, Vice President -Operations, Secretary, and Treasurer. Additional Officers may be elected by the Board of Directors at the discretion of the Board.

Section 5

Duties of the Officers:

A. The President shall be responsible for presiding over the membership meetings, coordinating all activiities of the Corporation, authorizing all Corporation expenditures, and making final decisions in internal matters not resolved by the other officers. The President may appoint committees for a period of up to one year. Standing Committees shall require the approval of the Board of Directors.

B. The Executive Vice President shall act as Chairman Ex Officio of all Committees. He shall receive and coordinate reports which the Committees may generate. He shall facilitate communications between Liaison Officers and the Corporation. He shall act in the place of the President in his absence.

C. The Vice President - Engineering shall be responsible for managing and coordinating the activities of the technical staff.

D. The Vice President - Operations shall be responsible for the internal administrative functions of the Corporation, and for coordinating the use of the services provided by the Corporation.

E. The Secretary shall be responsible for maintaining active communication with the Members and others who may be interested in the activities of the Corporation, and shall maintain records of the Corporations's activities and minutes of the meetings.

F. The Treasurer shall be responsible for accounting for all revenues and expenditures, collecting all dues, serving notices of renewal, developing the yearly budget, preparing a financial report to be included in the Annual Report and such other interim financial reports as may be required by the Board of Directors. He shall be responsible for assuring that an annual audit is performed by person(s) designated by the Board of Directors.

Section 6

The President may appoint Liaison officers, Consultants and such other appointed officials as the Board of Directors deems necessary and for the period deemed necessary.

Section 7

Vacancies in office:

A. The resignation of an Officer or Director shall be submitted at least one month before the effective date.

B. In event of resignation or demise of the President, the Executive Vice President shall assume the office of President until the next annual election of Officers.

C. In event of a vacancy in the office of any elected Corporate Officer other than the President as a result of the resignation or demise of such officer, the Board of Directors shall elect a temporary officer to fill the vacancy until the next annual meeting.

D. In event of resignation or demise of a member of the Board of Directors the position shall be filled until the next annual election by an alternate selected in the manner specified in Article V, Section 4.

Section 8

A Director may be suspended by presentation to the Secretary of a petition signed by ten percent of the Membership. Upon receipt of this petition, a special election shall be called by the Secretary or another Corporate Officer acting for him. This election shall take place at a special meeting of the Corporation which shall be held within sixty days from receipt of the petition.

Article V — "Meetings"

Section 1

An annual meeting of the Corporation shall be held between September 1 and December 31 of each year. The Membership shall be given not less than thirty days written notice of the date and place of the meeting. At this meeting the Officers shall present an annual report and the election of Directors shall take place.

Section 2

Written nominations of candidates who have agreed to serve if elected to the Board shall be submitted to the Secretary by an authorized Officer of the Member Society by a date specified in advance of the annual meeting. A candidate may also be nominated by five regular Members.

Section 3

At the annual meeting votes for directors shall be counted. A mail ballot shall accompany the meeting notice. Voting shall be conducted by secret mail ballot in a fair and democratic manner, and ballots must be received prior to the close of the annual meeting.

Section 4

The three or four Members receiving the largest number of votes shall be declared elected to the Board of Directors. The two nominees receiving the next largest number of votes shall be named first and second alternate.

Section 5

A simple majority of the Board of Directors shall constitute a quorum.

Section 6

The Presiding Officer may invoke *Roberts Rules of Order* in case of parliamentary question.

Section 7

The Board of Directors shall meet after the annual meeting but prior to January 1 for the purpose of electing Officers. Additional meetings of the Board of Directors shall be held as deemed necessary by the Board.

Article VI — "Policy as to Inventions and Patents"

Section 1

In the event that a Member of the Corporation, either solely or jointly with others, makes an invention, whether or not patentable, relating to the work of the Corporation, then the obligation of such Member to his regular employer shall take precedence and all rights in such invention shall be disposed of in accordance with the requirements of such regular employer.

Section 2

In the case of an invention in which the regular employer has no rights as determined by the employer and employee, the inventor may, if he wishes, disclose the invention to the Corporation in such form as it may designate, and may grant to the Corporation any rights in such invention which he may feel appropriate.

Article VII — "Adoption of the Bylaws"

The Bylaws of the Corporation shall be adopted upon affirmative vote by a simple majority of the Members present at a regular meeting. For this purpose only, a Member is defined as a person who has submitted a completed application form.

Article VIII — "Amending the Bylaws"

Changes in the Bylaws of the Corporation shall require approval of two-thirds or more of the Directors. Notice of an amendment which has received such approval shall be circulated to the Members of the Corporation. The amendment shall take effect thirty days after mailing of said notice, unless written objection is received from at least ten percent of the Membership. In that case a mail vote shall be taken. Approval of the amendment shall then require a simple majority of those Members responding.

Bylaws Approved: May 8, 1969

Revised: Nov. 12, 1969 (Art. IV, Sect. 5, ¶F, concerning audits, and delection of Art. IV, Sect. 9).
Revised: Dec. 15, 1970 (Art. II, Sect. 2b and 3, and Art. 5, Sect. 2, concerning change of "Member Club" to "Member Society").
Revised: Nov. 1972 (Art. V, Sect. 1, 2, 3 and 7, concerning changes in voting procedures and meeting dates).
Revised: Dec. 17, 1972 (Art. IV, Sect. 4, concerning provisions for the election of additional officers).
Revised: Oct. 15, 1978 (Art. V, Sect. 2, nomination of candidates to the Board).

PART III

“Fred Works OSCAR”

By Joe Kasser, G3ZCZ/4X

Review: When last we visited Fred, Pat and Norma (last year), Fred was beginning to pick up on the finer points of basic Mode A operation, the equipment and terminology. We now rejoin the merry bunch in Norwich, Norfolk, England.

“If you want to get into horizon and sub-horizon activity” continued Pat, “then you’ll want to use rotating directional antennas. Now Quads and Yagis at 10 Meters are heavy, wind-resistant and too large for the smaller VHF type of rotator. An excellent beam of good performance, yet with wind resistance and mass which is quite suitable for adding to an existing mounted system is the ‘ZL special’ or HB9CV antenna. A 10 Meter version made from 300 ohm ribbon cable can be taped to bamboo poles and fed with 75 ohm cable. It’s simple to make!”

“Would you sketch it for me?” asked Fred.

“OK” said Pat, and within moments he had produced Figure 4. “It’s turning radius is less than eight feet and it may be mounted six feet below a two Meter antenna without any interaction between the antennas. It *does* suffer from limitations of linear polarization but periods of total fadeout are only of a few seconds duration due to the superior signal strength.”

“Good fade margin,” said Fred, showing off.

“Exactly,” replied Pat. “And, if you want, you can place two of them at 90° separated by an electrical quarter-wave of coaxial cable, add a further quarter-wave of 52 ohm cable as a matching section and then run 75 ohm cable back to the receiver.”

“Like this,” asked Fred, showing his sketch work, (Figure 5).

“More or less,” said Pat. “G8NXI built a ZL special like that. I have got a photo of it somewhere. Let’s go back into the shack and I’ll look for it.”

Pat and Fred went back into the shack. There Pat dug deep into a pile of papers, QSL cards and magazines.

“It’s over there!”

He reached across and picked up something. As he leaned back an overfilled ashtray smashed on the floor.

“Blast!” exclaimed Pat. “Here. You look at this while I clean up.”

(He handed Fred the photograph and busied himself momentarily. See Figure 6)

“G8NXI put his up at 30 feet and found that it outperformed my TA-33 beam at 60 feet. Early measurements indicated a 1:1 SWR at 29.45 MHz and 1.2:1 over the OSCAR downlink band. It seems to have a forward gain of 5.4 dB. Front-to-back ratio is better than 30 dB and the side lobes at 45° are down more than 14 dB! It performs admirably at horizon passes and subhorizon signals are clearly audible under suitable condidtions.”

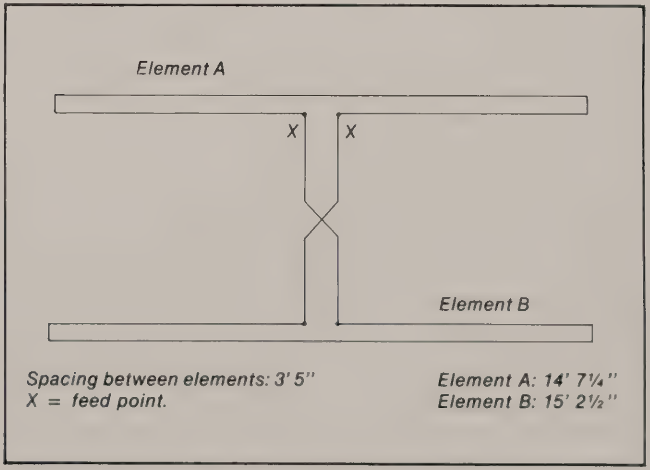


Fig. 4 — ZL Special made from 300-ohm ribbon for 29 MHz.

Parts I and II apeared in Orbit *9 and 10 respectively.*

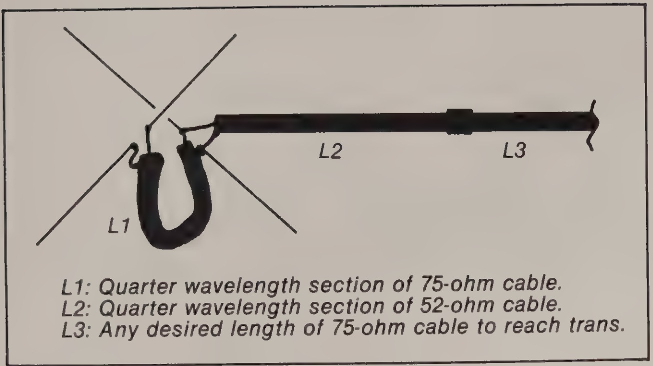

L2
L3
L1
L1: Quarter wavelength section of 75-ohm cable.
L2: Quarter wavelength section of 52-ohm cable.
L3: Any desired length of 75-ohm cable to reach trans.

Fig. 5 — Matching section for pair of crossed ZL Specials.

"Wow!" exclaimed Fred. "It's low cost, performance, ease of assemble, modest dimensions and low weight make this an ideal antenna for anyone who wants to improve his Mode A down-link performance or work the 28.878 MHz AMSAT 10 Meter Net."

"You said it," said Pat. "And, I agree with you, Fred."

"That's all well and good," Fred commented, "but my problem is different. I live in an apartment and can't put up any of *these* antennas."

"Well," Pat continued, "you've got a dipole already. Why not try a vertical and a single loop Quad? Bring all the feeders into your operating position and route them through a switch to the receiver. See how that works."

"Sounds good to me." Fred volunteered.

Just then the intercom buzzed. Pat answered and in a moment called out, "Fred, Norma says that your wife is on the phone. She wants to know if you're staying over tonight."

Fred looked at his watch.

"Boy, how the time flies when you're having fun! Tell her I'm coming home right now."

"OK!" Pat relayed the message to Norma.

"We'll be right in, love," he added, quickly hanging up the intercom.

"Thanks very much!" Fred concluded. "I'll try these antennas this weekend. I've got space on the balcony for them."

After saying goodnight to Norma and thanking her for the tea and biscuits Fred went home to his family.

It didn't take long! A few days later Fred installed two new antennas on his balcony. The children were dutifully warned not to touch them. Fred eagerly awaited the next Mode A pass.

He listened at the predicted time and heard only noise. He tried switching antennas and promptly noticed that certain types of noise were stronger on one antenna. But no satellite signals were received. He instinctively reached for the phone to call Pat. No sooner had Pat answered then out poured his little tragedy.

"But Fred," said Pat, "the reason you aren't hearing anything is the satellite is out of range."

"But the predictions show that it's *in* range," Fred argued.

"What *are* you using for predictions?" Pat queried.

Fred told him and Pat asked him to hold on while he found his copy of the same magazine. Pat came back on the phone laughing.

"Fred," he chortled, "ORBIT predictions are *always* given in Greenwich Mean Time GMT (or Coordinated Universal Time UTC) not local time. You forgot to convert GMT to local time!"

You're right," said Fred, "and I'm the village idiot!"

"Don't feel too bad" consoled Pat. "Lots of people do the same when getting started in OSCAR. Try again later and *then* let me know how you get on!"

When at last AMSAT-OSCAR 7 peeked over the horizon, Fred was ready. He copied the whole pass. Switching antennas compensated for QSB and kept signal strengths reasonably constant at S4 to 5. Now he could copy the beacon, although not well. Fred was happy enough having improved his setup. Yet he was not *entirely* satisfied. Here he had his balcony festooned with all manner of wires yet he felt that his receiving system was not quite adequate for OSCAR operation. Worse yet, he could not think of any way to improve it! Routinely, he picked up the telephone to call Pat.

After patiently listening to Fred's story, Pat replied, "Fred, your basic problem is that you can't get the antennas up in the air."

"So tell me something that I don't know," snapped Fred.

"Well, all is not lost you know," said Pat. "You have three choices."

"What are those?"

"Well first, you can forget about OSCAR."

"Not likely!" Fred leaped at the bait.

"Second, you can operate the way things are. You will make quite a few contacts providing you keep your own transmitted power level down so that you hear yourself as a weak signal. This means that you won't be

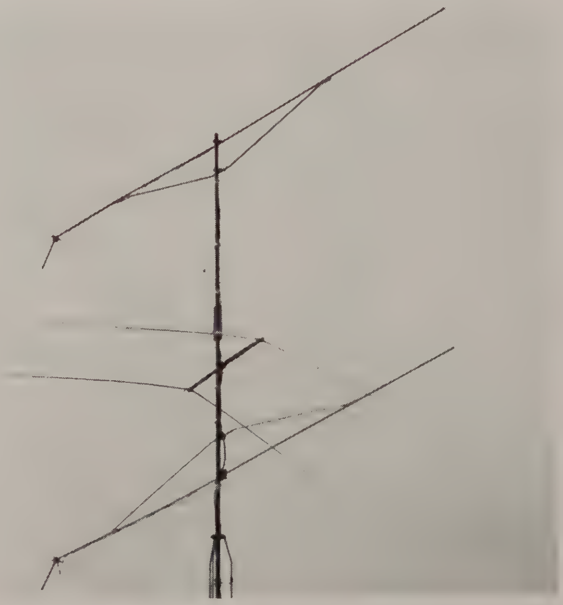


Fig. 6 — ZL Special; the center array.

a crocodile, will be able to work people but will miss the weak ones. That probably means missing some good DX."

"And my last choice?" chanced Fred.

"Have you considered Mode B or Mode J?"

"No," he replied. "Aren't they, uh, harder to work than Mode A?"

"In some ways yes...some ways no."

"Here we go again," Fred mused. "That was your answer on propagation I recall."

"Tell you what," said Pat. "Tomorrow is a Mode B and Mode J day. Why don't you come over and copy those passes and then let's discuss what's involved in working *those* modes."

"It's a deal." said Fred. "I'll come over and listen but for now I don't think I'll ever work OSCAR."

"Look Fred, why do you want to work OSCAR in the first place?"

"It's a challenge and living in an apartment I can't work any HF DX. I'm limited to VHF and there's only so much of that I can do on two Meter FM!"

"Yes. I forgot." Pat conceded the point. "Don't you have a multimode two Meter rig?"

"Yes. I bought it last year but didn't hear a thing on the low end of the band. I've been using it only on FM since and had intended to use the ssb/cw section for my Mode A uplink."

"You mean to say that you have *never* even *tried* listening to Mode B?" cried out Pat.

"Not really." shrugged Fred.

"Shame on you" retorted Pat. "What antenna are you using on two meters?"

"A ground plane mounted on the railing."

"Can you make up a turnstile?"

"Sure" said Fred. "How big?"

Pat gave him the dimensions (Figure 7). The antenna is made of hardware store ¼ inch aluminum rod with a plexiglas insulator at the center.

"Bring the two coax lines into the shack and route them and the vertical to the receiver via a three-way switch." finished Pat.

"OK." said Fred. "Are you sure this is going to work?"

"Do chickens lay eggs?" replied Pat.

Fred was not sure what *that* meant so he assumed the affirmative. In any event he decided to let the matter lie.

Later Fred drove to the hardware store and picked up a six foot section on aluminum rod. Making and mounting the antenna didn't take very long. By midnight he had the antenna mounted and the coax lines brought into the shack. They were fed to the transceiver through the same switch that he had used in his Mode A receiving arrangement. That night he fell off to sleep brimming with expectation.

Next evening Fred was once again down in the shack well before the scheduled equatorial crossing time for AMSAT-OSCAR 7. He tuned around the low end of the two Meter band for awhile but heard nothing. The band was quiet. He tuned to the FM band and copied several simplex QSO's as well as the local repeater. He checked out his antennas by checking the difference when monitoring the FM contacts. They seemed to work correctly. At last the spacecraft crossed the equator and Fred tuned the AMSAT-OSCAR 7 Mode B pass-band. Gone were the TV line oscillator harmonics. The power line noise was conspicuous by its absence. Fred tuned around and heard nothing except for the hissing noise in his receiver.

"It is a bust!" he cried out, "I should hear something by now."

Fred was about to give up and telephone Pat when a cw signal sounded in his speaker. He was overjoyed. He quickly tuned around listening to cw and ssb contacts. He tuned to the beacon and copied some of the telemetry too.

Signals from the satellite were now loud and clear. Fades were fewer than on Mode A and signals were *much* stronger. The beacon peaked at S7 and individual signals ranged from barely receivable to S8 or even S9. Twenty minutes later the signals died abruptly as the spacecraft retreated below Fred's horizon.

"Mode B is the way to go." he vowed to himself. Instantly he picked up the telephone to call Pat.

"Hello Fred," said Pat answering the telephone on the first ring. "I just bet Norma that this would be you on the phone."

"How were you so sure?" pressed Fred.

"The Mode B pass just finished." Pat laughed. "Do you want to come over and listen to Mode J?"

"Not tonight." replied Fred. "I was out late last night and should spend *some* time at home. Say, that pass was fantastic!"

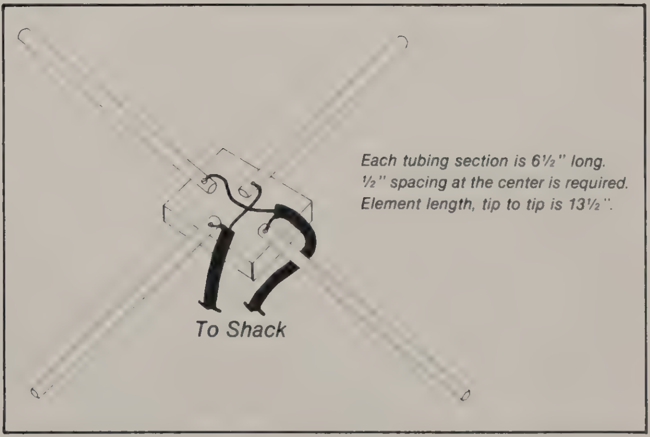
"Most people find it that way," said Pat, "when they get around to copying it."

"But why," asked Fred.

"Well," continued Pat, "do you remember our discussion on antennas the other day?"

"Sure do."

"Well, when we talked about the ideal antenna, we discovered that it was impractical on 10 Meters because of its size."



Each tubing section is 6½" long.
½" spacing at the center is required.
Element length, tip to tip is 13½".

Fig. 7 — 432 MHz Turnstile.

"On two Meters it would be a lot smaller and would be practical," Fred interrupted.

"Exactly." continued Pat. "In fact, the majority of *serious* two Meter and 70 cm stations already use high gain Yagi antennas for terrestrial communications. Many of them first get on Mode A by firing their regular two Meter antenna at the bird and using a dipole for 10 Meter receiving. These people also tend to be VHF-only operators who are graduating to the satellite field."

"Yes?" Fred puzzled.

"Well, using a high-gain, rotatable antenna allows them to put a disrespectfully large signal into the satellite at the horizon (when they cannot hear it), and a poor one into the satellite when it is high in the sky and they *can*! Isn't that ludicrous!"

"Crocodiles," Fred added.

"Anyhow, you just copied Mode B with a simple, no-gain antenna. If you added 10 dB of gain to the antenna and a preamplifier with 10 or 12 dB more gain you would be copying a superb signal from AMSAT-OSCAR 7's Mode B transponder."

Just then Fred heard the sounds of World War III coming from the den.

"Pat," he exclaimed, "I have got to sign off 'cause the kids are fighting again."

"OK." said Pat. "Let's get together tomorrow."

"OK. Bye."

Hanging up the phone Fred raced into the next room to quell the domestic distress.

About a week later, Fred was over at Pat's house again to pick up the 432 MHz transmitter. They were sitting in the shack while Pat dusted off the exciter.

"If Mode B is so much better than Mode A, what is Mode J like?" Fred opened.

"Ah." said Pat. "It depends."

"On what?" rejoined Fred.

"It depends on how good a receiving system you have for 435 MHz. The Mode J transmitter on AMSAT-OSCAR 8 transmits only 500 milliwatts to a quarter wave monopole antenna. AMSAT-OSCAR 7 uses a canted turnstile antenna for Mode B and has an output power of 6 to 8 Watts. It is thus putting out a much greater signal up to 12 dB or 2 "S" units stronger. In addition, the path loss on the Mode J downlink is about 158 dB at 435 MHz and only about 149 dB at 145 MHz. That means the Mode J received signals are at least 21 dB down from the Mode B signals. It we then include the fact that coax cable losses are greater at 435 MHz than at 145 MHz, the signals at the receiver are that much less."

"That's fantastic," said Fred. "If Mode J is so weak, how can people use it?"

"Well," responded Pat, "don't forget that we assumed an antenna with no gain. Let's add an antenna with 10 to 20 dB gain, a preamplifier with another 10-12 dB gain and let's use quality coaxial cable with a loss of not more than 3 dB. That improves our signal by 23 to 35 dB which makes it very usable. K9CIS described his experiences in getting onto Mode J in *Orbit* magazine #8.

"I guess that there are people who swear *at*, and those who swear *by* Mode J," joked Fred.

"You could say that." said Pat. "There's a pass coming up in a few minutes. Let's listen to it."

Pat powered up the rig and switched the antennas. He consulted a range circle chart, looked up and said, "Three minutes to AOS."

"How do you know exactly?" asked Fred. "I find the equatorial crossing time and wait until it shows up."

"There are many ways." replied Pat. "You can use a computer, a calculator or a simple circular-range plotter as I do. Look. This is a simple circular projection of the world centered on my QTH. You can use the same one for pointing HF antennas. A range circle is drawn around the QTH. Now, by definition I can access the satellite anytime that it is in the circle. An orbit track plot can be rotated around the globe like so. I place the orbit track line on the equator at the crossing point for the next orbit and count the number of divisions until the track crosses my range circle and there you are. Three minutes, which, by the way, is just about now!"

No sooner had he said that when the sound of the AMSAT-OSCAR 8 Mode J beacon was heard in the receiver. Pat allowed Fred to tune during the pass while he adjusted the antennas. Fred noted that the signals had much less QSB than Mode B but only reached about S6 on the receiver. What few signals were there were perfectly copyable. As predicted, they vanished suddenly at LOS."

"Not bad,"conceded Fred, "but fade margin is not too good at 435 MHz, Pat."

"I have been meaning to do something about it." Pat replied. "Mode J does *not* have as deep fades as Mode B on my helical antenna so I haven't bothered. S6 is perfectly copyable anyhow."

"Why were there such few signals as compared to Mode B?" Fred asked.

"I suppose other people have receiver problems." said Pat. "Also, since the uplink is at 145 MHz and the downlink is at 435 MHz, the third harmonic of the transmitter desenses the receiver adding to the problems. It's really a shame because the ground station can be set up to produce a good received signal.

"That pass was much storter than Mode B." observed Fred.

"That's because the satellite is in a lower orbit." Pat replied. "That means reduced maximum range and DX available."

Fred picked up the transmitter and felt a glow of anticipation. Saying his goodnights, he left Pat and Norma to their television and journeyed home to set up his station for his date with OSCAR.

The next evening he was ready. Not having steerable antennas, he did not have to track the spacecraft so he could concentrate on his transmitting and receiving. He calculated his approximate receiver frequency based on the Xtal frequency, allowed a little for Doppler shift and wrote it down. When AMSAT-OSCAR 7 came over his horizon he heard the friendly "Hi Hi" from the beacon. Hesitatingly he sent "dits" on the transmitter and tuned to where he thought the downlink should be. He tuned for a few seconds hearing many signals and suddenly heard his own dits. "Is it me?" he wondered and stopped sending. The "dits" stopped too! "It is!" he exclaimed and immediately began to call CQ. Sure enough, the signal he was listening to also began to call CQ and it signed his call sign. He was sure that he was hearing himself. He noticed that the frequency was changing and thought "Aha! Doppler effect," to himself as he retuned slightly. He stopped sending with after a "K" and waited. No reply. Disappointed, he sent another CQ. He was hearing himself S6 to S7. Others should be able to hear him as well he concluded. Then, he heard a signal swish across the band and zero-beat on him. Fred ended his CQ call. The other signal mercifully began to call him. Joy of joys! This was too much! His first OSCAR QSO. Fred answered the call, sent his name, report and QTH. He blurted out that this was his first OSCAR QSO. Back came his report: 567 (not bad for 10 Watts to a turnstile).

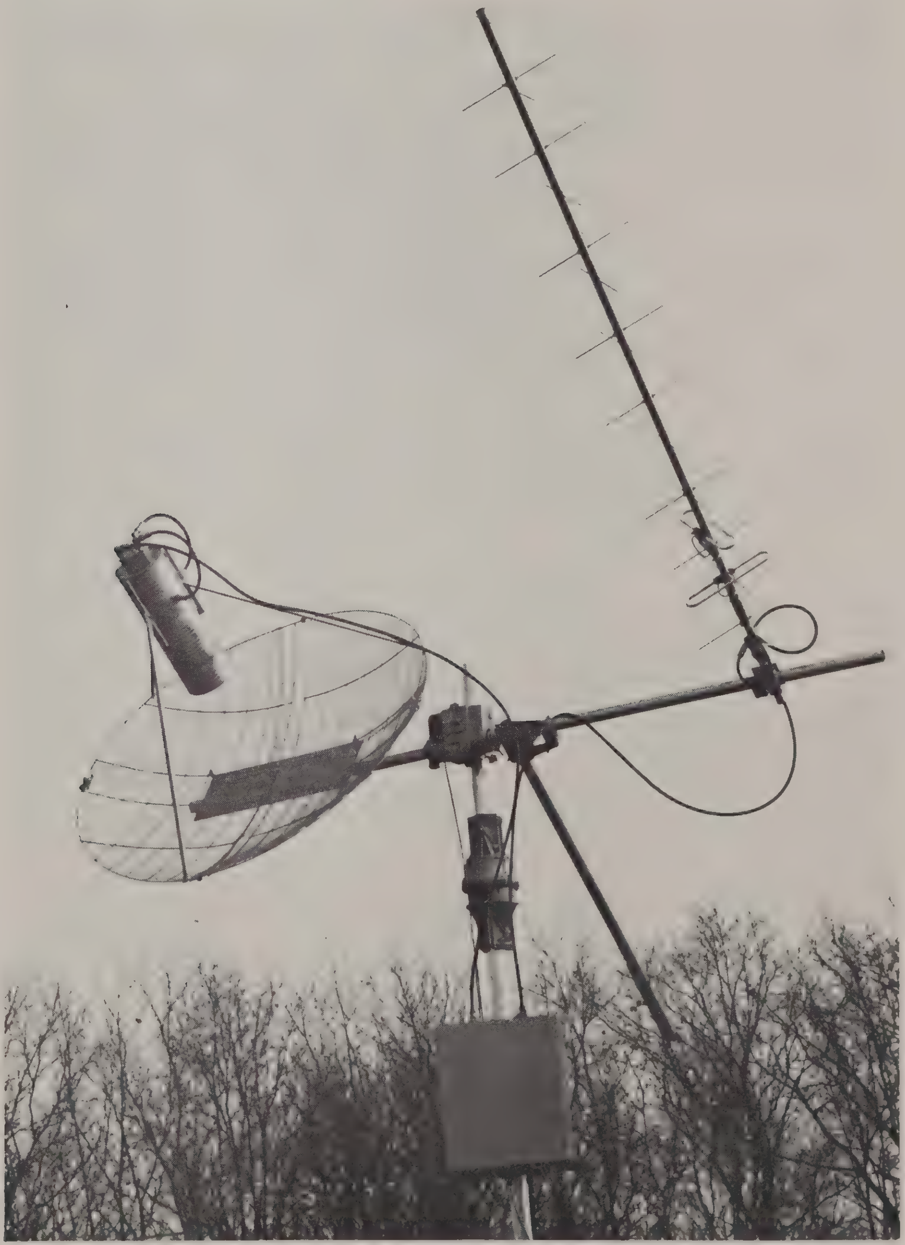
"What do you know," sighed Fred. "I finally worked OSCAR."

[And they lived happily ever after.]

Editor's note: This concludes the "Freddie" series; although references to AO-7 are of course now out-of-date, the mentions were retained for historical and contextual purposes. AO-7 ceased operating in June 1981.

Comets

In case you are wondering what the rest of W1HDX's satellite antenna system looks like, here is a broader view. His description of the dish appears beginning on page 4 of this issue.



Orbit Predictions

By Phil Karn, KA9Q

```
oscar-7:
Wed Mar 30 01:20:18 1983 UTC: Ascending node at       115.7 west
Nodal period: 114.93915 min
Longitude increment: 28.736758 deg w/orbit
Element set #478
Element set epoch: Tue Nov 30 09:46:21 1982 UTC

oscar-8:
Wed Mar 30 00:50:29 1983 UTC: Ascending node at        93.9 west
Nodal period: 103.16790 min
Longitude increment: 25.794288 deg w/orbit
Element set #742
Element set epoch: Tue Mar 22 10:34:41 1983 UTC

oscar-9:
Wed Mar 30 00:54:54 1983 UTC: Ascending node at       145.6 west
Nodal period: 94.71960 min
Longitude increment: 23.678851 deg w/orbit
Element set #440
Element set epoch: Wed Mar 23 09:27:58 1983 UTC

rs-3:
Wed Mar 30 00:22:00 1983 UTC: Ascending node at       172.4 west
Nodal period: 118.51969 min
Longitude increment: 29.756726 deg w/orbit
Element set #52
Element set epoch: Sat Mar 19 11:31:29 1983 UTC

rs-4:
Wed Mar 30 01:40:23 1983 UTC: Ascending node at       187.6 west
Nodal period: 119.39341 min
Longitude increment: 29.975331 deg w/orbit
Element set #90
Element set epoch: Wed Mar 23 00:31:57 1983 UTC
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rs-5:
Wed Mar 30 00:48:23 1983 UTC: Ascending node at       173.8 west
Nodal period: 119.55452 min
Longitude increment: 30.015594 deg w/orbit
Element set #79
Element set epoch: Thu Mar 24 01:20:28 1983 UTC

rs-6:
Wed Mar 30 01:17:39 1983 UTC: Ascending node at       185.4 west
Nodal period: 118.71698 min
Longitude increment: 29.806076 deg w/orbit
Element set #50
Element set epoch: Thu Mar 24 00:51:19 1983 UTC

rs-7:
Wed Mar 30 00:53:18 1983 UTC: Ascending node at       176.9 west
Nodal period: 119.19549 min
Longitude increment: 29.925791 deg w/orbit
Element set #94
Element set epoch: Mon Mar 21 08:17:46 1983 UTC

rs-8:
Wed Mar 30 00:31:31 1983 UTC: Ascending node at       168.6 west
Nodal period: 119.76317 min
Longitude increment: 30.067908 deg w/orbit
Element set #204
Element set epoch: Thu Mar 24 00:48:34 1983 UTC
```

```
Satellite: oscar-7
Catalog number: 7530
Epoch time:        82334.40718817
   Tue Nov 30 09:46:21 1982 UTC
Element set:                478
Inclination:         101.3994 deg
RA of node:          336.3150 deg
Eccentricity:       0.0011748
Arg of perigee:      269.7184 deg
Mean anomaly:         90.2542 deg
Mean motion:      12.53379655 rev/day
Decay rate:            -2e-08 rev/day^2
Epoch rev:              36792
Semi major axis:     7829.772 km
Anom period:       114.889371 min
Apogee:              1481.375 km
Perigee:             1462.978 km

Satellite: oscar-8
Catalog number: 10703
Epoch time:        83081.44075485
   Tue Mar 22 10:34:41 1983 UTC
Element set:                742
Inclination:          98.7637 deg
RA of node:           98.2877 deg
Eccentricity:       0.0005770
Arg of perigee:      195.4035 deg
Mean anomaly:        164.6946 deg
Mean motion:      13.96549749 rev/day
Decay rate:          1.47e-06 rev/day^2
Epoch rev:              25713
Semi major axis:     7285.313 km
Anom period:       103.111287 min
Apogee:               912.845 km
Perigee:              904.438 km
Translate freq:      581.0974 mhz
Invert:                     1
Beacon:              435.0965 mhz
```

```
Satellite: oscar-9
Catalog number: 12888
Epoch time:        83082.39442220
   Wed Mar 23 09:27:58 1983 UTC
Element set:                440
Inclination:          97.5352 deg
RA of node:           48.3410 deg
Eccentricity:       0.0001396
Arg of perigee:      225.6474 deg
Mean anomaly:        134.4621 deg
Mean motion:      15.21163225 rev/day
Decay rate:         6.115e-05 rev/day^2
Epoch rev:               8075
Semi major axis:     6881.987 km
Anom period:        94.664397 min
Apogee:               515.549 km
Perigee:              513.627 km
Beacon:              145.8250 mhz

Satellite: rs-3
Catalog number: 12997
Epoch time:        83078.48020061
   Sat Mar 19 11:31:29 1983 UTC
Element set:                 52
Inclination:          82.9581 deg
RA of node:           25.7519 deg
Eccentricity:       0.0057404
Arg of perigee:      221.1520 deg
Mean anomaly:        138.5206 deg
Mean motion:      12.15575695 rev/day
Decay rate:             4e-08 rev/day^2
Epoch rev:               5553
Semi major axis:     7991.326 km
Anom period:       118.462388 min
Apogee:              1668.176 km
Perigee:             1576.429 km
```

```
Satellite: rs-4
Catalog number: 13000
Epoch time:        83082.02218938
   Wed Mar 23 00:31:57 1983 UTC
Element set:                 90
Inclination:          82.9539 deg
RA of node:           28.2136 deg
Eccentricity:       0.0017600
Arg of perigee:      286.4152 deg
Mean anomaly:         73.4931 deg
Mean motion:      12.06666541 rev/day
Decay rate:          1.12e-06 rev/day^2
Epoch rev:               5555
Semi major axis:     8030.600 km
Anom period:       119.337029 min
Apogee:              1685.970 km
Perigee:             1657.702 km

Satellite: rs-5
Catalog number: 12999
Epoch time:        83083.05588240
   Thu Mar 24 01:20:28 1983 UTC
Element set:                 79
Inclination:          82.9605 deg
RA of node:           28.3849 deg
Eccentricity:       0.0009463
Arg of perigee:      315.9507 deg
Mean anomaly:         44.0837 deg
Mean motion:      12.05040479 rev/day
Decay rate:           1.1e-07 rev/day^2
Epoch rev:               5560
Semi major axis:     8037.820 km
Anom period:       119.498060 min
Apogee:              1677.464 km
Perigee:             1662.251 km
```

```
Satellite: rs-6
Catalog number: 13002
Epoch time:        83083.03564248
   Thu Mar 24 00:51:20 1983 UTC
Element set:                 50
Inclination:          82.9586 deg
RA of node:           24.2301 deg
Eccentricity:       0.0048817
Arg of perigee:      226.7347 deg
Mean anomaly:        132.9637 deg
Mean motion.      12.13552833 rev/day
Decay rate:            -1e-08 rev/day^2
Epoch rev:               5599
Semi major axis:     8000.201 km
Anom period:       118.659852 min
Apogee:              1672.280 km
Perigee:             1594.171 km

Satellite: rs-7
Catalog number: 13001
Epoch time:        83080.34568085
   Mon Mar 21 08:17:47 1983 UTC
Element set:                 94
Inclination:          82.9577 deg
RA of node:           28.0496 deg
Eccentricity:       0.0020583
Arg of perigee:      247.4133 deg
Mean anomaly:        112.4729 deg
Mean motion:      12.08674848 rev/day
Decay rate:            -7e-08 rev/day^2
Epoch rev:               5544
Semi major axis:     8021.705 km
Anom period:       119.138741 min
Apogee:              1678.027 km
Perigee:             1645.005 km
```

```
Satellite: rs-8
Catalog number: 12998
Epoch time:        83083.03372725
   Thu Mar 24 00:48:34 1983 UTC
Element set:                204
Inclination:          82.9427 deg
RA of node:           29.3461 deg
Eccentricity:       0.0022939
Arg of perigee:      359.0295 deg
Mean anomaly:          1.0611 deg
Mean motion:      12.02935231 rev/day
Decay rate:          2.01e-06 rev/day^2
Epoch rev:               5550
Semi major axis:     8047.192 km
Anom period:       119.707193 min
Apogee:              1687.512 km
Perigee:             1650.594 km
```

New Ariane Launch Schedule:

An ESA News Release

At its meeting on 23 and 24 February 1983, the council of the European Space Agency (ESA) took note of the status of the Ariane programme and studied the consequences of the delay, due to the failure of the Ariane L5 (+) launch, on the forthcoming missions.

Technical Status of the Programme

The technical recommendations of the board of enquiry, which related to the quality of the turbopump gearing and the operation of the lubrication system (see ESA/CNES press release of 21 October 1982), have been implemented. During recent months, versions of the turbopump gearing and the lubrication system from which these defects have been eliminated have been developed and tested. All the work involved is being submitted to a detailed review process aimed at confirming the flight-readiness of the L6 launcher.

After running in and inspection, the L6 turbopump has been fitted to the 3rd-stage engine, which is due to undergo hot acceptance testing by mid-March. This will be followed by assembly of the propulsion system and then of the complete 3rd stage, which will be dispatched to Guiana in late April. The 1st and 2nd stages wil be shipped in March.

Concurrently with the specific action on the turbopump, certain important launcher elements have been intensively reviewed in order to improve their reliability, namely: the inertial-platform system, and the 3rd-stage feed and pressurisation systems.

Launch Schedule

In the light of the foregoing, the council confirmed its unanimous confidence in and support for the Ariane programme and adopted the following launch schedule: the Ariane L6 launch is scheduled for Friday, 3 June 1983 and January 1984 respectively.

Furthermore, mindful of the interests of the agency's programmes and of the need to preserve the confidence shown by other Ariane customers and of the time-schedule commitments made, the council has taken the following steps to ensure that each payload is launched as soon as possible:

In order to reproduce a mission profile resembling as closely as possible that of L5—dual mission comprising the injection of two satellites into geostationary transfer ofbit by means of the dual launch system, SYLDA—Ariane L6 will launch the ECS 1 (+ +) and AMSAT (+ + +) satellites.

With regard to the European x-ray observation satellite (EXOSAT), the scheduled launch date for L7 gives an insufficient safety margin vis-a-vis the closing of the launch window and, moreover, there is a risk of certain experiments in the payload deteriorating. Accordingly, and in response to the wishes of the European scientific community for an early launch, the ESA Council has decided to use a thor-delta 3914 launcher for placing EXOSAT in orbit. The launch is due to take place from Vandeberg Base in late May 1983. The Ariane 1 vehicle remaining available at the end of the promotion series will be assigned to launching, in July 1985, ESA's Giotto Probe, whose task is to encounter Halley's Comet early in 1986.

The L7 and L9 launchers have been assigned to the Intelsat V satellites F7, F8 and F9 of the International Telecommunications Satellite Organization.

The first launch of the Ariane 3 version, L10, is currently scheduled for March 1984. Ariane 3 is a more powerful version of the launcher, capable of injecting two spacecraft, each of up to 1195 kg, into geostationary transfer orbit. The agency's satellites ECS-2 and MARECS-B2, the French satellites Telecom-1A and B, the Arab League satellite, ARABSAT-1, as well as the American satellites Western Union's WESTAR-6, Southern Pacific's SPACENET-1 and 2 and G-STAR 1 and 2 will be launched by Ariane 3.

(+) Prior to L5, the Ariane launcher had undergone 4 test launches, of which 3 were successful. These tests enabled 6 payloads to be placed in orbit, the most important being the meteorological satellite, METEOSAT, (ESA) and the telecommunications satellites APPLE (India) and MARECS-A (ESA/INMARSAT).

(+ +) European communication satellite. (ESA/EUTELSAT)

(+ + +) AMSAT = Radio Amateur Telecommunications satellite

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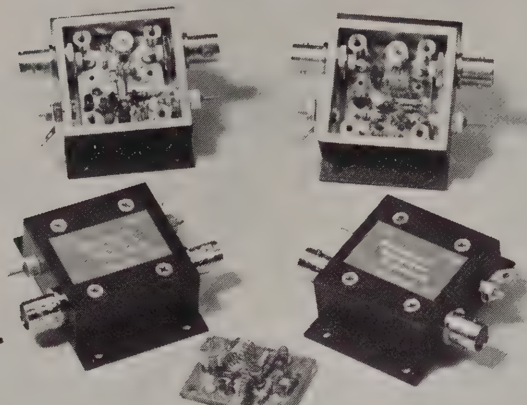

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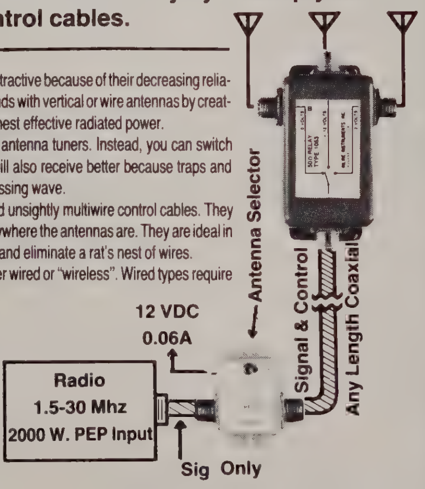

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Satellite Log

*By Geoffrey Falworth**

Satellite Log features launches into orbit since the beginning of 1980. The satellite name is that assigned by the launching agency (the international designation is in parenthesis) and the orbit (period, inclination to Earth's equator, apogee height, perigee height) is for shortly after launch; later maneuvers may modify this orbit. Transmissions are those which are publicly reported or assumed from the type of spacecraft involved.

Cosmos 1418 (1982-104A) launched on 1982 Oct 21; initial orbit: 92.33 min, 50°.67, 413 km, 371 km; transmissions: none reported. Radar calibration satellite.

RCA Satcom 5 (1982-105A) launched on 1982 Oct 28; initial orbit: 1436.09 min, 0°.16, 36816 km, 36765 km; transmissions: as RCA Satcom 4 (1982-04A). Commercial communications satellite over longitude 143° West.

DSCS 15 (1982-106A) launched on 1982 Oct 30; initial orbit: 1432.06 min, 2°.47, 35779 km, 35643 km; transmissions: 7250.100, 7250 to 7375, 7400 to 7450, 7490 to 7675, 7675.100, 7700 to 7750 MHz. Defense Satellite Communications System phase 2 spacecraft over longitude 55° West.

DSCS 3A (1982-106B) launched on 1982 Oct 30; initial orbit: 1436.34 min, 0°.44, 35862 km, 35728 km; transmissions: 225 to 400; 7250 to 7310, 7330 to 7390, 7410 to 7495, 7515 to 7575, 7595 to 7655, 7675 to 7725 MHz. Defense Satellite Communications System phase 3 spacecraft over longitude 126° West.

Progress 16 (1982-107A) launched on 1982 Oct 31; initial orbit: 88.76 min, 51°.62, 246 km, 186 km; transmissions: none reported. Cargo and supply spacecraft docked with Salyut 7 on 1982 Nov 2.

Cosmos 1419 (1982-108A) launched on 1982 Nov 2; initial orbit: 89.29 min, 70°.34, 268 km, 211 km; transmissions: none reported. Recoverable reconnaissance satellite.

Cosmos 1420 (1982-109A) launched on 1982 Nov 11; initial orbit: 100.80 min, 74°.00, 812 km, 780 km; transmissions: none reported. Data relay satellite.

STS 5 (1982-110A) launched on 1982 Nov 11; initial orbit: 90.31 min, 28°.47, 301 km, 295 km; transmissions: 259.400, 296.800, 2205.000, 2217.500, 2250.000, 2287.500 MHz. OV-102 Columbia in first operational flight carried SBS 3 (1982-110B) and Telesat 6 (1982-110C).

SBS 3 (1982-110B) launched on 1982 Nov 11; initial orbit: 1436.17 min, 0°.28, 35796 km, 35786 km; transmissions: as SBS 2 (1981-96A). Satellite Business Systems spacecraft over longitude 94° West.

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Telesat 6 (1982-110C) launched on 1982 Nov 11; initial orbit: 1436.14 min, 0°.04, 35806 km, 35776 km; transmissions: 11703 to 11757, 11716 to 11770, 11764 to 11818, 11777 to 11831, 11825 to 11879, 11838 to 11892, 11886 to 11940, 11899 to 11953, 11947 to 12001, 11960 to 12014, 12008 to 12062, 12021 to 12075, 12069 to 12123, 12082 to 12136, 12130 to 12184, 12143 to 12197 MHz. Telesat Canada communications spacecraft over longitude 112°.5 West.

Operations 9627 (1982-111A) launched on 1982 Nov 17; initial orbit: 92.12 min, 96°.98, 521 km, 232 km; transmissions: none reported. Reconnaissance satellite.

Cosmos 1421 (1982-112A) launched on 1982 Nov 18; initial orbit: 89.24 min, 70°.34, 263 km, 211 km; transmissions: none reported. Recoverable reconnaissance satellite.

Iskra 3 (1982-33AD) launched on 1982 Apr 10; initial orbit: 91.53 min, 51°.64, 355 km, 349 km; transmissions: 29.5776 and 29.580 to 29.620 MHz. Amateur communications satellite ejected from Salyut 7 on 1982 Nov 18.

Raduga 11 (1982-113A) launched on 1982 Nov 26; initial orbit: 1436.28 min, 1°.22, 35806 km, 35781 km; transmissions: 3675, 3775, 3875, 7250 to 7750 MHz. Soviet communications satellite at Statsionar 2 location over longitude 35° East.

Cosmos 1422 (1982-114A) launched on 1982 Dec 3; initial orbit: 89.68 min, 72°.85, 288 km, 228 km; transmissions: none reported. Recoverable reconnaissance satellite.

Satellite News: The news bulletin of satellites, spacecraft and space activity is available in four editions: *Space Objects Digest, Military Space Digest, Space Operations Review* and *Space Systems Digest.* The price is 25 cents per issue: subscribe for as many issues as you like. Payments and orders by International Money Order, cash or check. Please add $2 to personal checks for UK bank charges. Orders should be sent to: Geoffrey Falworth, 12 Barn Croft, Penwortham, Preston PR 10 SX, England.

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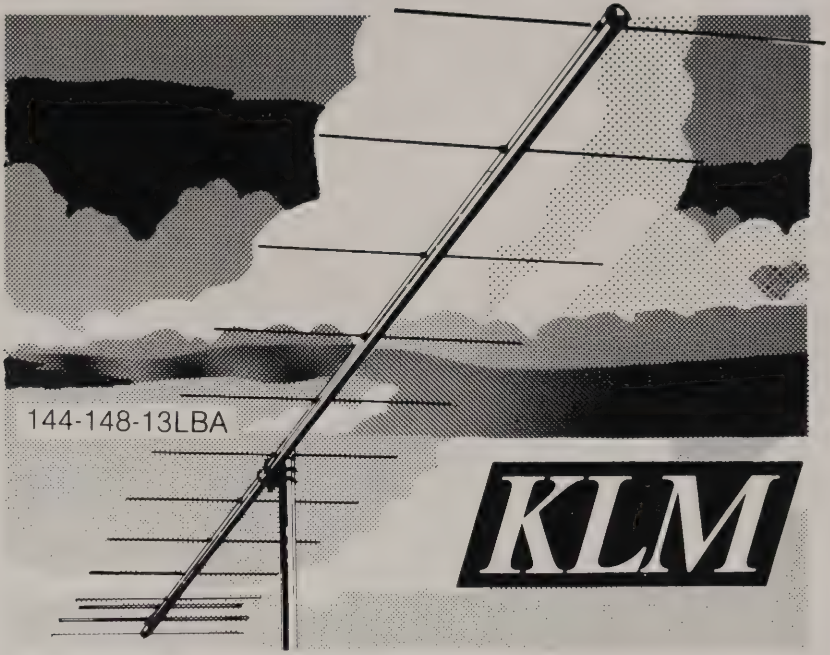

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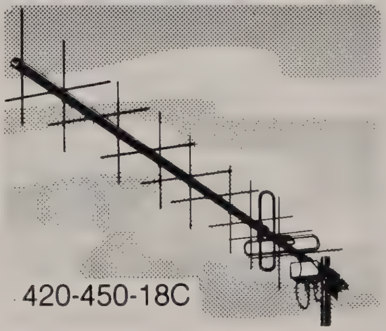

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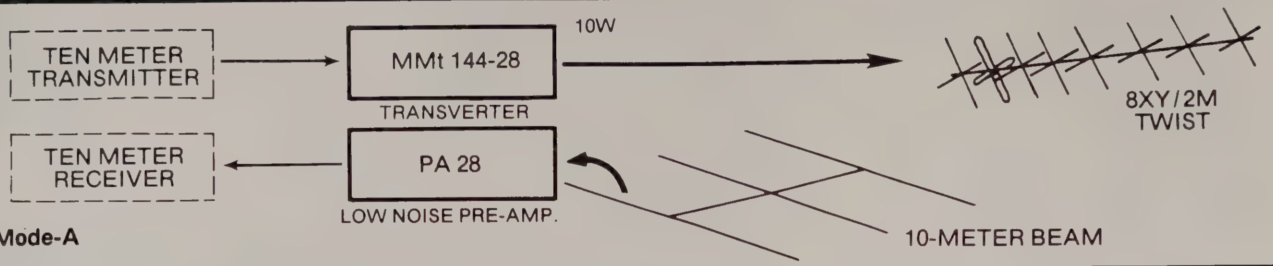

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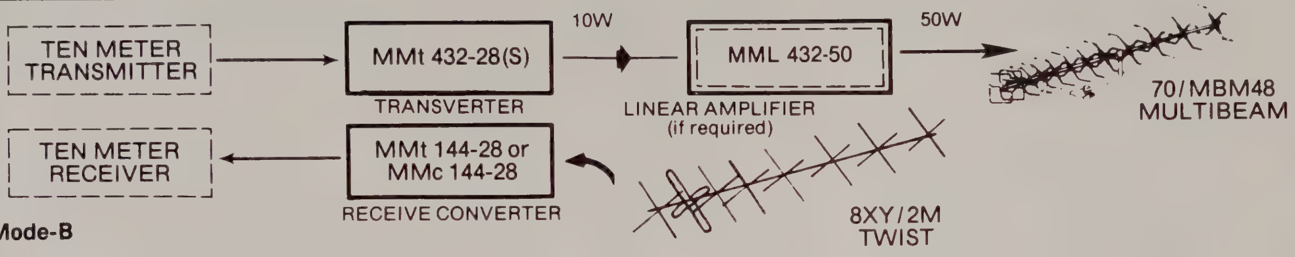

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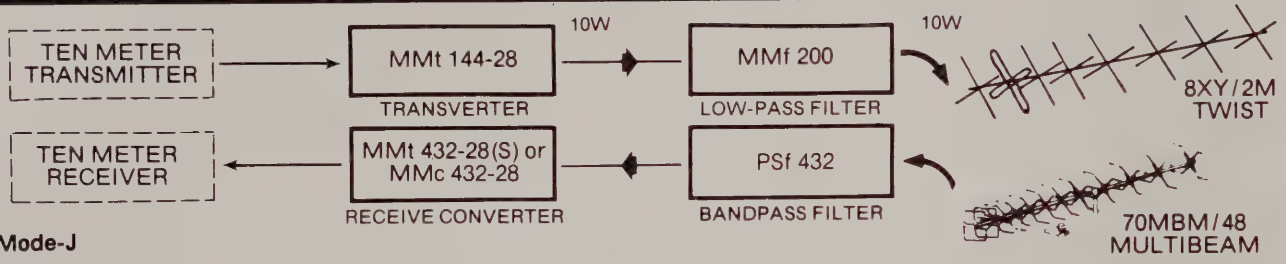

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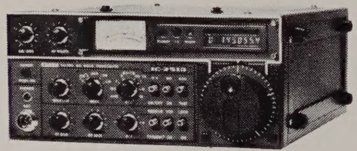

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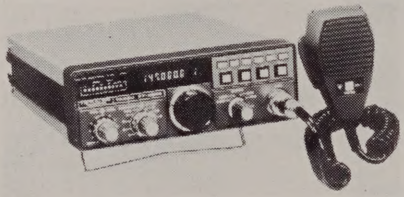

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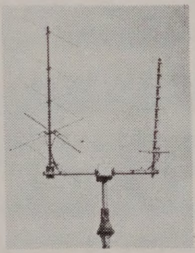

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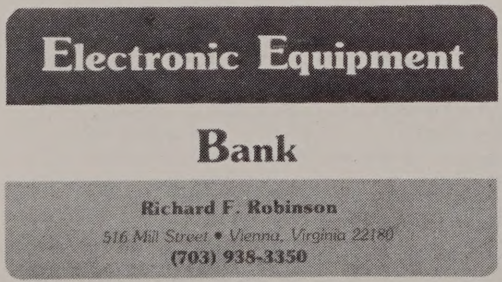

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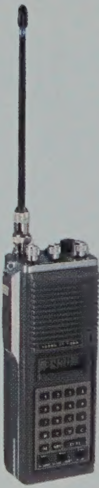

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